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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 4
FEBRUARY 15, 1977

W77-01551 -- W77-02075

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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Institut Fiziki, Krasnoyarsk (USSR).
For primary bibliographic entry see Field 5A.
W77-01563

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Institut Fiziki, Krasnoyarsk (USSR).
For primary bibliographic entry see Field 5A.
W77-01564

2. WATER CYCLE

2A. General

A MODEL STUDY OF THE EFFECTS OF ARTIFICIAL RECHARGE,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W77-01883

TWENTY-SIX-YEAR CYCLICAL DISTRIBUTION OF DROUGHT AND FLOOD IN CEARA, BRAZIL,
California State Univ., Fresno.
For primary bibliographic entry see Field 2B.
W77-01897

HYDROLOGICAL AND HYDRAULICAL CONCEPTUAL MODELS APPLICABLE TO OVERLAND AND RIVER TRANSPORT MODELING,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
V. Novotny.
Wisconsin Univ., Madison, Water Resources Center, Literature Review No. 4, August 1976. 61 p. 14 fig., 13 tab., 72 ref. EPA R00514201.

Descriptors: *Hydrologic models, *Mathematical models, *River flow, *Runoff, *Methodology, Overland flow, Infiltration, Soil texture, Hydraulic conductivity, Equations, Penetration, Groundwater movement, Soil-water movement, Interception, Rainfall-runoff relationships, Depression storage, Evaporation, Evapotranspiration, Melt water, Channel flow, *Reviews, Watersheds(Basins).
Identifiers: *Literature reviews.

Various modeling methods cited in the literature are reviewed and recommendations are made for computing runoff in connection with water quality. The models are categorized into three groups: (1) Simple steady-state approximations of a phenomena; (2) time-variable or dynamic models based on analytical or numerical solution of the set of differential equations describing the phenomenon; and (3) models which utilize a transformation method to arrive at a direct input-output relationship through a system transform function. The discussion of runoff estimation models presents methods for computing runoff, complex rainfall-runoff models, rainfall-runoff relationships, and instantaneous surface runoff hydrograph equations. Modeling infiltration and groundwater flow entails the hydrologic characteristics of soil types and soil permeability rates, which are discussed in detail. Deterministic equations for the effect of surface detention as affected by land use and land slope are compared; as well as methods for estimating evaporation, evapotranspiration, and snowmelt. Mathematical models for flow routing include numerical methods, the Muskingum flow routing method, input-output transformation of flow hydrographs, channel for routing unit hydrographs, and a multiple linearization model. (Auen-Wisconsin)
W77-02036

2B. Precipitation

RESPONSE OF THE PATUXENT ESTUARY TO A WINTER STORM,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 2L.
W77-01635

STOCHASTIC STRUCTURE OF CLOUD AND RADIATION FIELDS,
Akademiya Nauk Estonskoi SSR, Tartu. Institut Fiziki i Astronomii.
Yu. R. Mullamaa, M. A. Sulev, V. K. Poldmaa, H. A. Ohvril, and H. J. Niylisk.
NASA Technical Translation F-822, October 1975. 157 fig, 9 tab, 122 ref. Translation of 'Stokhasticheskaya Struktura Poley Oblachnosti i Radiatsii', Academy of Sciences of the Estonian SSR, p 1-283, 1972. NASA NASw-2485.

Descriptors: *Clouds, *Radiation, *Stochastic processes, Statistics, Statistical methods, Instrumentation, Equipment, Surveys, Measurement, Model studies, Mathematical models, Cloud cover, Heat transfer, Atmosphere, Meteorology.

Results were presented of theoretical and experimental studies of the stochastic structure of cloud fields and radiation of the Earth's atmosphere. A description was given of the array of equipment developed and used to conduct ground and aircraft experimental studies. A survey was made of the measurement methods and the methods of the theory of random processes employed in theoretical analysis. A detailed description was given of the results of the experimental studies, and a comparison was made with the theoretical model established. (Sims-ISWS)
W77-01640

FINAL REPORT, HIGH PLAINS COOPERATIVE PROGRAM CLOUD SURVEY AND SEEDING RESEARCH AIRCRAFT AND ASSOCIATED DATA PROCESSING,
Colorado International Corp., Boulder.
For primary bibliographic entry see Field 3B.
W77-01687

CLOUD INTERACTION AND THE FORMATION OF THE 15 JUNE 1973 TORNADO IN THE FACE MESONETWORK,
National Oceanic and Atmospheric Administration, Miami, Fla. Environmental Research Labs.
R. L. Holle, and M. W. Maier.
NOAA Technical Memorandum ERL WMPO-33, October 1976. 61 p, 39 fig, 2 tab, 23 ref.

Descriptors: *Tornadoes, *Rainfall, *Squalls, *Clouds, Storms, Florida, Oklahoma, Networks, Meteorology, Climatology.
Identifiers: *Mesonetworks.

The 15 June 1973 tornado that occurred within the FACE surface mesonetwork was measured from a series of 15 photographs taken in the vicinity. Very weak synoptic scale flow was evident at all levels to 100 mb over south Florida. A weak ridge at low levels and a slight trough at 500 mb were the only significant features in the area. Normal stability for summer 1973 was found at Miami, but shear was the weakest of the summer, equalled only on 16 June. Rainfall over Florida was related to heating, coastal, and lakeshore effects of the peninsula and not to external factors. Two clouds with tops of 15.6 km reached their peak intensity 25 km east and west of the tornado 50 minutes before its start. A new cloud line rapidly formed halfway between the original clouds; the tornado dipped from this line. The radar detected significant amounts of rain at 2 km when the tornado was at its peak intensity. Five minutes later the downdraft rain reached the funnel and caused it to dissipate. Surface rain gages measured very heavy precipitation another 5 minutes later at the old tornado position. Another tornado in Oklahoma is examined and rain shafts are seen on either side in earlier stages. This case suggests that cloud interaction in a moving squall line may by as important as that of the stationary Florida environment of 15 June. (NOAA)
W77-01700

BOUNDARY-LAYER TRAJECTORY ESTIMATES COMPARED WITH CONSTANT-VOLUME BALLOON TRAJECTORIES IN THE GREAT PLAINS,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Lab.
W. H. Hoecker.
NOAA Technical Memorandum ERL ARL-59, August 1976. 35 p, 10 fig, 2 tab, 6 ref.

Descriptors: *Great Plains, *Meteorological data, *Forecasting, *Boundary layers, *Balloons, Winds.
Identifiers: *Geostrophic wind vectors, Tetroons, *Air trajectories.

The reconstruction of boundary layer air trajectories traced out by constant-volume balloons (tetroons) flown in the Great Plains is described. The tetroons, flown at 300 m above the ground, were deployed in September and October of 1971 during periods of strong southerly, weak northerly and moderate to strong westerly winds. Use was made of geostrophic, layer average and adjusted surface winds in the reconstructions. The accuracy of the reconstructed, or estimated, trajectory was based on the distance the estimated trajectory missed the tetroon recovery site at its closest approach. Trajectories were computed for approximately the same length of time that the tetroons were aloft. Calculations suggest that reasonably accurate boundary-layer trajectories can be constructed by using geostrophic wind vectors backed by about 20 deg. in southerly and westerly winds, and 40 deg. in northerly winds. Such trajectories can be quickly and easily determined from sea-level synoptic maps. Also, trajectory forecasts can be made by this technique from the prognostic surface maps issued by the National Weather Service. (NOAA)
W77-01701

SUMMERTIME RADAR ECHO DISTRIBUTIONS OF MOIST CONVECTION OVER SOUTHERN NEVADA AND ADJACENT AREAS FOR 1971 AND 1972,
National Oceanic and Atmospheric Administration, Las Vegas, Nev. Air Resources Lab.
D. Randerson.
NOAA Technical Memorandum ERL ARL-58, August 1976. 41 p, 14 fig, 3 tab, 15 ref.

Descriptors: *Precipitation(Atmospheric), *Nevada, *Winds, *Climatology, *Thunderstorms, Orography, Convection, Storms, Radar, Distribution patterns, *Spatial distribution, *Temporal distribution.
Identifiers: *Radar echo distributions, *Moist convection, Desert thunderstorms.

Two warm seasons of hourly radar echo activity are used to develop a preliminary climatological picture of the spatial and temporal distributions of moist convection over southern Nevada and adjacent areas. The echo distributions are adjusted

for the probability of radar detection of surface precipitation. Results of the analysis quantitatively portray the enhancement of echo activity by mountainous terrain. During daylight hours, the high mountainous areas are shown to receive approximately 2 to 3 times more echo activity than the desert valleys and roughly 5 times more activity between midnight and 0700 LST. Spatial variations in echo activity are compared with different categories of K-index and precipitable water. The results suggest that by relating the spatial distribution of echoes to these stability parameters, measured from a single station, quantitative estimats can be made of the spatial variability of echo activity over a rather large area. In addition, local variations in radar echo activity are related to the 500-mb wind directions measured from a rawinsonde station located in the center of the area of analysis. Results show a strong dependency of echo activity for flow with an easterly component. (NOAA)
W77-01702

AN EVALUATION OF PRECIPITATION PH DATA FROM THE WASHINGTON, DC AREA COLLECTED DURING 1975,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Lab.
J. M. Miller, G. F. Cotton, D. H. Pack, J. M. Mitchell, and M. E. Smith.
NOAA Technical Memorandum ERL ARL-57, August 1976. 27 p, 8 fig, 4 tab, 5 ref, append.

Descriptors: *Precipitation(Atmospheric), *Meteorological data, *Rain, *Snow, Hydrogen ion concentration, District of Columbia, Acidity.
Identifiers: Air quality measurement, *Acidity of precipitation.

An experimental volunteer program to collect precipitation for determination of pH was begun in April, 1974. The purpose was to gain practical experience in collection and analysis and some data on the acidity of precipitation in the Washington DC area. Rain or snow is collected in Taylor 4 inch diameter plastic rain gages by volunteers, transferred to washed plastic bottles, tightly capped, and brought to the ARL offices in Silver Spring. pH measurements are made with a Fisher electrode and an Orion 401 pH meter following the manufacturer's instructions. pH determinations are usually made within 12-48 hours of collection. The pH values compare well with pH values measured in the Northeastern U.S. (NOAA)
W77-01703

AN AID TO AGRICULTURAL DEW FORECASTING,
National Weather Service, Fort Worth, Tex. Southern Region.
N. P. Cimino.
NOAA Technical Memorandum NWS SR-87, September 1976. 11 p, 2 tab, 4 ref, append.

Descriptors: *Dew, *Forecasting, *Agriculture, *Weather, Agroclimatology, Equations, Texas, Oklahoma.
Identifiers: *Dew forecasting, *Forecast equations.

Equations which forecast dew intensity, starting time and drying time are presented. The limited developmental data make these equations probably not as rigorous as needed for a sound agricultural forecast program, but they do supply the forecaster with a useful tool to aid in dew forcasting. Verification of the dew intensity equation on independent data does indicate reasonable skill for both the area of development (Weslaco, Texas) and a separate area (Oklahoma City). The present system does not supply feedback of verifying observations which is prerequisite to improving the forecasting of dew. (NOAA)
W77-01704

WATER WHEEL ALL SEASON RAIN GAGE,
For primary bibliographic entry see Field 7B.
W77-01753

DUST STORMS,
S. B. Idso.
Scientific American, Vol. 235, No. 4, p 108-114, October, 1976. 2 tab.

Descriptors: *Dust storms, *Soil erosion, *Wind erosion, Dusts, Loess, Winds, Meteorology, Human diseases, Forecasting, Satellites(Artificial), Deserts, Arid lands, Precipitation(Atmospheric), Humidity, Vegetation, Moisture.
Identifiers: *Haboob, *Valley fever.

Dust storms play an important role in changing the surface of the planet and have a significant impact on the people living in arid lands. The dynamics of dust storms, their effects, the areas where they most frequently occur, and the studies that have been completed about them, are evaluated. The most direct threat of dust storms is soil erosion. The primary method of controlling erosion by wind is to maintain a surface cover, if rainfall is below normal for two years and the amount of crop residue produced is small, tillage may be required as an emergency measure to reduce soil erosion. The relationship between cool air, rainfall and dust storms is discussed. This type of dust storm, the haboob, from the Arabic word for violent wind, is associated with the rainy season in the Sudan and in the Arizona desert. The use of meteorological satellites in the study and possible forecasting of dust storms is evaluated. (Jamail-Arizona)
W77-01895

TWENTY-SIX-YEAR CYCLICAL DISTRIBUTION OF DROUGHT AND FLOOD IN CEARA, BRAZIL,
California State Univ., Fresno.
C. Markham.
The Professional Geographer, Vol. 27, No. 4, p 454-456, November, 1975. 1 fig, 1 tab, 4 ref.

Descriptors: *Flood forecasting, *Flood recurrence interval, *Rainfall, *Excessive precipitation, *Air circulation, *Droughts, Atlantic Ocean, Sea breezes, Atmosphere, Precipitation(Atmospheric), Meteorology, Water shortage, South America, *Cycles, Hydrologic budget.
Identifiers: Periodicity, Sea temperature, *Brazil.

In Northeastern Brazil high annual rainfall brings floods and lack of it causes drought. This paper examines the cycles of drought and flood in the region. Rainfall records are examined from 1850 to 1973 and data is presented showing the occurrence of wet and dry years at the three stations studied aligned in cycles of twenty-six years. From records of one of the stations examined, the chi-square significance text applied to the power spectrum shows less than one-percent probability that this twenty-six-year periodicity is the result of chance. A cause for the periodicity is not known, but may be a long-term resonance in the ocean-atmosphere system governing the mean position of the intertropical convergence as well as equatorial sea temperatures. Atlantic sea temperatures may prove to be the basis for long-range drought and flood forecasts in Brazil, even if the twenty-six-year periodicity proves to be spurious. Assuming that the periodicities will continue into the future, forecasts for floods and droughts can be made for Northeastern Brazil. (Jamail-Arizona)
W77-01897

RAINFALL EROSIVITY OVER RHODESIA.
Rhodesia Univ., Salisbury. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W77-01901

AN EXAMINATION OF THE RELIABILITY OF SHORT TERM RECORDS IN PRECIPITATION VARIABILITY STUDIES,
Washington State Univ., Pullman.
C. R. Schroeder, and J. K. Steingraber.
Association of American Geographers, Proceedings, Vol. 7, p 200-203, 1975. 4 fig, 2 tab, 2 ref.

Descriptors: *Weather data, *Weather forecasting, *Computer programs, *Rainfall, Precipitation(Atmospheric), Reliability, Climatic data, Climatology, Meteorology, Variability, Data collections, Meteorological data, Cycles, United States.

The thirty-year period of record often employed in precipitation studies seems of dubious validity when based upon the assumption that it is representative of the precipitation variability for a longer period of time. A study was conducted utilizing climatological data for an eighty-one-year period of record (1880 to 1960) for thirty-nine stations. A computer program was written in FORTRAN IV to determine how many years previous to 1960 would have to be included in order to guarantee that the coefficient of variation would remain within seventy, eighty, and ninety percent levels of the eighty-one year coefficient of variation. The results indicated that the thirty-year record has little validity if it is used with the assumption that it is representative of a longer period of record. Thus, the precipitation studies on the western United States will, for the present, be hindered by a paucity of records of sufficient length. (Jamail-Arizona)
W77-01904

APPLIED CLIMATOLOGY AND FOOD PRODUCTION: THE CASE OF GRAPEFRUIT QUALITY IN THE RIO GRANDE VALLEY OF TEXAS,
Texas A and I Univ., Kingville.
For primary bibliographic entry see Field 3F.
W77-01905

ON THE POSSIBLE DETECTION OF TSUNAMIS BY A MONITORING OF THE IONOSPHERE,
Cooperative Inst. for Research in Environmental Science, Boulder, Colo.
For primary bibliographic entry see Field 2L.
W77-01918

2C. Snow, Ice, and Frost

A THREE-DIMENSIONAL NUMERICAL MODEL OF ICE SHEETS: TESTS ON THE BARNES ICE CAP, NORTHWEST TERRITORIES,
Colorado Univ., Boulder. Inst. o Arctic and Alpine Research.
M. W. Mahaffy.
Journal of Geophysical Research, Vol. 81, No. 6, p 1059-1066, February 20, 1976. 11 fig, 1 tab, 28 ref.
NSF GA-40248, NSF GA-43191.

Descriptors: *Glaciation, *Model studies, *Mathematical models, *Ice, *Canada, Ice cover, Ice loads, Computer models, Glaciers, Glacial drift, Flow, Glaciology.
Identifiers: *Ice caps, *Barnes Ice Cap(Canada), *Ice sheets.

A three-dimensional numerical model of ice flow was developed to study the areal distribution of mass in an ice sheet of arbitrary shape that is not necessarily in a steady state. The model was applied to the 5900 sq km Barnes Ice Cap, Baffin Island, Northwest Territories, Canada, as a test case, and the results were compared with the present day ice cap. The results were generally consistent with glaciological and glacial geological field evidence. The results suggested that basal sliding may be occurring beneath the southwestern

side of the present ice cap. The model has general applicability to several studies involving the question of the speed of ice sheet development and the time/load history of the last major glaciation. (Sims-ISWS)
W77-01610

SNOW-ROAD CONSTRUCTION--A SUMMARY OF TECHNOLOGY FROM PAST TO PRESENT,
Civil Engineering Lab. (Navy), Port Hueneme, Calif.
For primary bibliographic entry see Field 4C.
W77-01638

EVALUATION OF THE USE OF SALT BRINE FOR DEICING PURPOSES,
Connecticut Dept. of Transportation, Rocky Hill, Materials Testing Lab.
For primary bibliographic entry see Field 4C.
W77-01639

LOW ADHESIONAL ARCTIC OFFSHORE PLATFORM,
Chevron Research Co., San Francisco, Calif. (Assignee).
For primary bibliographic entry see Field 8G.
W77-01712

LOW LEVEL SNOW PRECIPITATION GAUGE,
Idaho Industrial Instruments, Inc., Boise, (Assignee).
R. G. Morrison.
U.S. Patent No. 3,975,641, 7 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1214, August 17, 1976.

Descriptors: *Patents, *Precipitation(Atmospheric), Precipitation gages, Snowfall, Precipitation intensity, Instrumentation, Radioisotope, Background radiation, Electromagnetic waves.

This invention relates to the accurate gauging of precipitation accumulated at a given location over a prolonged period of time and provides a continuous measure of above ground water inventory. A mixture of naturally occuring aggregate and radioactive substances, such as uranium or thorium bearing ores and ordinary binders, such as asphalt or cement, are utilized. The mixture is formed into a geometrical configuration, such as a ring, with sufficient isotopic inventory to create an isoflux line at a detector of approximately 15 times the natural background radiation. The radioactive, ring-shaped source serves as a transmitter of electromagnetic signals emitted from a geometrically fixed zone to a point detector at a fixed location. The ring source and point detector thus forms a convergent isoflux at the detector. The measurement of the attenuation of the transmitted signals then establishes the density of the substances accumulated between the source and the detector. Any change in this attenuation can thus be correlated to water which is a measure of precipitation. (Sinha-OEIS)
W77-01744

ICE CONDITIONS AND THE PROPOSED CONTAINMENT AND REMOVAL OF SPILLED OIL ON ST. CLAIR AND DETROIT RIVERS,
Canada Centre for Inland Waters, Burlington, (Ontario).
For primary bibliographic entry see Field 5G.
W77-01802

POTENTIAL USE OF SATELLITE IR DATA FOR ICE THICKNESS MAPPING,
Development and Resources Transportation Co., Silver Spring, Md.
L. A. LeSchack.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 490, Price codes: A03 in paper copy, A01 in microfiche. Final Report, March 1975. 28 p, 8 fig, 3 tab, 4 ref. NOAA-NESS 3-35384.

Descriptors: *Remote sensing, *Ice, *Mapping, *Arctic, Sea ice, Ice cover, Temperature, Infrared radiation, Satellites(Artificial), Forecasting, Dimensional analysis, Analytical techniques, Data processing.
Identifiers: *Ice thickness, Ice reporting, Ice movement, Infrared mapping.

An approach to automated mapping of the thickness and movement of Arctic ice by means of statistical examination of NOAA VHRR satellite IR data was discussed. In previous work a useful empirical relationship was observed: airborne or satellite radiant temperature measurements of sea ice are proportional to the thickness of the ice, have normal distriburtions, and the areas beneath the distribution curves are proportional to the surface area of the pack ice types from which they were derived. In the present work, substantially more data were examined so that it is now possible to outline the basic steps for implementing an algorithm to automate ice mapping. Five passes made by NOAA-2 and NOAA-3 satellites were used for the analysis. These passes provided radiant temperature data of the Beaufort Sea ice during January, February, March, April, and May 1974. Examination of the shapes of the temperature distribution histograms derived from the data suggested differences that could be delineated by simple statistical techniques. (Sims-ISWS)
W77-01913

ON THE DEVELOPMENT OF A SEASONAL CHANGE SEA-ICE MODEL,
National Center for Atmospheric Research, Boulder, Colo.
W. M. Washington, A. J. Semtner, Jr., C. Parkinson, and L. Morrison.
Journal of Physical Oceanography, Vol. 6, No. 5, p 679-685, September 1976. 3 fig, 1 tab, 15 ref.

Descriptors: *Sea ice, *Model studies, *Arctic, *Antarctic, Mathematical models, Radiation, Solar radiation, Heat transfer, Ice, Ice cover, Seasonal, Distribution patterns, Distribution, Oceans, Oceanography.

A three-dimensional thermodynamical model of sea ice was developed which is capable of simulating seasonal changes over the Arctic and Antarctic regions. The model was patterned after the earlier work of Maykut and Untersteiner and Semtner. Instead of specifying the fluxes of energy at the top of the ice as is usually done in sea ice modeling, the components of surface energy balance were computed from observed climatological atmospheric data. Also, a new parameterization of leads by Semtner was tested and shown to improve the simulation. The model results agreed with observations in the Arctic, but the results were less successful in the Antarctic. Possible reasons for deficiencies of the model were that ice transport is not included and oceanic heat flux is not properly accounted for. These aspects will be added and improved in future development of the model. (Sims-ISWS)
W77-01925

SNOW DAMAGE IN ARIZONA PONDEROSA PINE STANDS,
Forest Service (USDA), Tempe, Ariz.; Forest Hydrology Lab.; and Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W77-01949

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS AND LANDSAT DATA-COLLECTION SYSTEM OPERATIONS IN CENTRAL ARIZONA,
Geological Survey, Tucson, Ariz.
H. H. Schumann.
In: Arizona Water Commission Report No 7; Proceedings of 19th Annual Arizona Watershed Symposium, September 24, 1975, Phoenix, Arizona: Arizona Water Commission, p 24-30, 1975. 8 fig, 1 tab, 4 ref.

Descriptors: *Snow cover, *Snowmelt, *Remote sensing, *Satellites(Artificial), *Telemetry, Snow surveys, Hydrologic data, Aerial photography, Reservoir operation, Arizona, Flood control, Watershed management.
Identifiers: *Salt-Verde watershed(Ariz).

Repetitive Landsat and NOAA-4 satellite imagery together with aerial surveys are being evaluated to develop an operational capability for mapping snowcover distributions on the Salt-Verde watershed of central Arizona. Satellite telemetry is being used also for near-real time relay of hydrologic data to aid in the management and operation of reservoirs on the Salt and Verde Rivers. For use in rating satellite imagery, the depth and distribution of snowcover was measured by examination of oblique aerial photographs of snow markers. This method allowed rapid and economical determination of snow depths. The Landsat Data-Collection System (DCS) relays hydrologic data from remote and relatively inaccessible earth-based sensors. The Landsat telemetry system relays information from streamflow- and snow-monitoring installations located in the upper parts of the Salt-Verde Watershed. (Woodard-USGS)
W77-02017

2D. Evaporation and Transpiration

SOIL WATER CONTENT AND EVAPORATION DETERMINED BY THERMAL PARAMETERS OBTAINED FROM GROUND-BASED AND REMOTE MEASUREMENTS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W77-01618

THE MOVEMENT OF SNOW-WATER THROUGH SMALL PLANT-SOIL SYSTEMS IN THE MEDICINE BOW MOUNTAINS, WYOMING,
Wyoming Univ., Laramie. Dept. of Botany.
D. H. Knight, and A. T. Harrison.
Wyoming Water Resources Research Institute, Laramie, Water Resources Series No. 62, April 1976. 65 p, 6 tab, 17 fig, 47 ref. OWRT A-011-WYO(2), 14-31-0001-3551, 3851, 4051, 5051.

Descriptors: *Soil-water-plant relationships, *Transpiration, *Melt water, Nutrient requirements, Coniferous forests, *Wyoming, Lodgepole pine trees, Snowmelt, Interception, Soil water movement.
Identifiers: *Medicine Bow Mountains(Wyo).

Data are presented which show the significance of various pathways for the movement of snowmelt water through a stand of lodgepole pine forest in the Medicine Bow Mountains, southeastern Wyoming. Patterns of precipitation, interception, soil water recharge, and transpiration are described. The data suggest that nearly all of the water transpired comes into this system as snow and that all of the snow water could be transpired by the trees. The significance of transpiration when the ground is snow-covered is emphasized. If nearly all of the average water input to the stand is transpired, nutrient loss from the stand by leaching would occur only during years of heavier-than-normal snowfall. Throughfall of snow is thought to be nearly 100%; throughfall of summer showers ranged from 56-80%. Data on litter interception and soil waterholding capacity are presented. Transpiration for the stand was estimated to be 6.8 liters per square meter per day in

late June and early July. The maximum transpiration rate for a single tree was 3.5 liters per hour at midday, with nighttime transpiration greatly reduced. Stomatal regulation of transpiration during the day was observed in late July and August.
W77-01812

APPLIED CLIMATOLOGY AND FOOD PRODUCTION: THE CASE OF GRAPEFRUIT QUALITY IN THE RIO GRANDE VALLEY OF TEXAS,
Texas A and I Univ., Kingville.
For primary bibliographic entry see Field 3F.
W77-01905

ABSCISIC ACID LEVEL IN TOMATO LEAVES AFTER A LONG PERIOD OF WILTING,
Aarhus Univ., (Denmark). Inst. of Plant Physiology.
For primary bibliographic entry see Field 2I.
W77-01906

USE OF CONSTANT LEVEL JAIN EVAPORIMETER IN SCHEDULING IRRIGATION,
Udaipur Univ. (India). Dept. of Agronomy.
T. C. Jain.
Annals of Arid Zone, Vol. 14, No. 1, p 25-28, 1975. 2 ref.

Descriptors: *Evaporimeters, *Evaporation, *Water loss, Irrigation, Moisture deficit, Soil moisture, Evapotranspiration, Moisture content, Root zone, Soil water, Moisture stress, Crop production, Soil water movement, Irrigation effects, Measurement, Asia.
Identifiers: *Jain evaporimeter.

Recent research in irrigation shows that the rate of evapotranspiration or soil moisture depletion from a cropped area depends on the soil moisture content of the effective root zone and the evaporative demand of the atmosphere. The use of a Constant Level Jain Evaporimeter to measure the evaporative demand of an atmosphere and thus for scheduling irrigation is discussed. This device consists of a can with water connected by a tube to a bottle filled with water. As soon as the water in the can evaporates, it is refilled with water from the bottle and hence the amount of water evaporated can be accurately read from graduation in the bottle. The equipment is simple, easily handled by skilled farmers, economical, and is a good indicator of evaporative demand. (Jamail-Arizona)
W77-01907

THERMAL MODELING AND ITS RELATION TO CANAL EVAPORATION,
Geological Survey, Bay St. Louis, Miss.
H. E. Jobson.
In: Energy Recovery; Proceedings of the Third National Conference on Complete Watereuse--Symbiosis as a Means of Abatement for Multi-Media Pollution, June 27-30, 1976, Cincinnati, Ohio: American Institute of Chemical Engineers and Environmental Protection Agency Technology Transfer, p 370-379, 1976. 4 fig, 19 ref.

Descriptors: *Evaporation, *Canals, *Model studies, *Heat transfer, *Heat budget, Computer models, Methodology, Mass transfer, Air-water interfaces, *Water temperature, Evaluation, *California.
Identifiers: *San Diego aqueduct(Calif).

The thermal balance of the 16-mile concrete-lined San Diego aqueduct in southern California was studied for a 1-year period beginning July 24, 1973. Water temperatures and meteorologic variables at each end of the canal were recorded at 10-minute intervals. The data are analyzed in the Eulerian framework by applying a one-dimensional numerical model. Preliminary results, using 28 days of data, indicate that the downstream temperature can be predicted with a root-mean-square error of about 0.25 degrees C. The data are also analyzed in the Lagrangian framework to determine the wind function for a Dalton-type evaporation formula and to evaluate the effect of various factors on the predicted downstream temperature. (See also W76-05314) (Woodard-USGS)
W77-02029

2E. Streamflow and Runoff

FLASH FLOODS.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences, Publication No. 112, 1974. 141 p.

Descriptors: *Conferences, *Flash floods, *Floods, *Flood forecasting, Warning systems, Monitoring, Instrumentation, Remote sensing, Cities, Urban runoff, Flood protection, Networks, Rainfall Measurement, Precipitation(Atmospheric), Hydrologic data, Data processing, Arid lands.

Flash floods were discussed at a symposium held at Paris in 1974. The subject areas discussed were: methods for measuring flash floods; observation networks, their operation and data collection; inventory of flash floods; methods for computing; protection, forecasting networks; and economic consequences, disasters. (See also W75-07201-W75-07203, W76-00301; and W77-01934 thru W77-01944) (Humphreys-ISWS)
W77-01933

COLLECTION AND PROCESSING SYSTEM OF HYDROLOGICAL DATA DURING FLASH FLOODS ON THE RIVER YODO,
Kyoto Univ. (Japan).
T. Ishihara, Y. Inada, and M. Hayashi.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 3-8, 1974. 5 fig.

Descriptors: *Flood forecasting, *Flash floods, *Hydrologic data, *Data processing, Data storage and retrieval, Data transmission, Networks, Automation, Rainfall, Floods, Runoff, Watersheds(Basins).
Identifiers: *Japan, *River Yodo(Japan).

The data collection and processing system required to forecast and to issue warnings of flash floods on the Yodo River is now in operation. The paper described some interesting and important aspects of the practical system which involves 40 rain gages and 49 flow stations: the transformation of measured data to electric signals and their transmission by radio, the sampling interval for collection and processing of data, the methods of checking and interpolating transmitted data, and the methods of storing and computing. Processed data can be used directly for flood runoff calculation. Therefore, it is possible to forecast a flash flood and give an alarm sufficiently early. (See also W77-01933) (Humphreys-ISWS)
W77-01934

HYDRAULIC PERFORMANCE OF FLUMES FOR MEASUREMENT OF SEDIMENT-LADEN FLASH FLOODS,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
R. E. Smith, and D. L. Chery, Jr.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 17-22, 1974. 4 fig, 4 ref.

Descriptors: *Flash floods, *Water measurement, *Floods, *Arizona, Flumes, Flow measurement, Hydrologic data, On-site investigations, Instrumentation, Hydraulics, Sediment control, Flow rates, Flood flow.
Identifiers: *Walnut Creek(Az).

A network of 11 specially designed flumes has been established on the 155 sq km Walnut Gulch Experimental Watershed, Arizona, specifically to monitor the size and propagation of flash floods typical to this region. Hydraulic problems of flash flood flow measurement were discussed, including high velocities, high sediment transport, alluvial instability, and extremely rapid increase in discharge rate (shock fronts). Several possible improvements for these flumes were suggested as a result of extensive model testing, prototype measurements now in progress, and several years of experience with flow peaks as large as 140 cu m/s. (See also W77-01933) (Humphreys-ISWS)
W77-01935

FIELD MONITORING EQUIPMENT FOR HYDROLOGICAL STUDIES IN A SMALL CATCHMENT,
Bristol Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W77-01936

DISASTERS CAUSED BY FLASH FLOODS,
National Research Center for Disaster Prevention, Tokyo (Japan).
T. Kinosita.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 67-72, 1974. 6 fig, 1 tab, 4 ref.

Descriptors: *Flash floods, *Instrumentation, *Warning systems, Flood forecasting, Rain gages, Disasters, Monitoring, Urbanization, Topography, Climate, Rivers, Runoff, Forecasting.
Identifiers: *Japan.

The climatic and topographic reasons for flash floods in Japan were discussed. Runoff characteristics are affected by man's activities, such as urbanization and river improvement works. Warning systems must be improved to keep pace with social developments. A flash flood warning system is generally designed to locate heavy rainfall and to disseminate information as soon as possible. Weather radar is one instrument that has been used successfully to locate areas of intense rainfall. A telephone rain gage is another instrument system convenient for flood warning purposes. If the appropriate number is dialed, a telephone line is connected to the pulse counter of the tipping bucket rain gage. After a short announcement of the name of the station, the number stored in the counter is sent by a tone pulse. Anyone and any computer can collect rainfall data from any place using such a system. Another simple warning device is an oil can with a small orifice. An electrode which is fixed at a certain level can find the water level which corresponds to the warning intensity of rainfall. An alarm lamp or buzzer warns people of the impending flash flood. (See also W77-01933) (Humphreys-ISWS)
W77-01937

OPERATIONAL ARRANGEMENT OF RAIN-GAUGE STATIONS IN FORECASTING FLASH FLOODS,
Kyoto Univ. (Japan).
For primary bibliographic entry see Field 4A.
W77-01938

WARNING SYSTEM FOR SEVERE FLOODS,
Water Survey of Canada, Calgary (Alberta).
For primary bibliographic entry see Field 7B.
W77-01939

FLOOD MEASUREMENTS IN AN URBAN ENVIRONMENT: A DATA USER'S VIEWPOINT,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-01940

THE OPERATIONAL USE OF DIGITAL RADAR DATA FOR FLASH FLOOD MONITORING,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 7B.
W77-01941

SYSTEMS FOR PREPARING TIMELY FLASH FLOOD WARNINGS,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 4A.
W77-01942

FLASH FLOODS IN INDIA,
Central Water and Power Commission, New Delhi (India).
P. Singh, A. S. Ramanathan, and V. G. Ghanekar.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 114-118, 1974. 2 fig, 3 ref.

Descriptors: *Flash floods, *Warning systems, *Organizations, Flood forecasting, Floods, Flood frequency, Instrumentation, Flood damage.
Identifiers: *India.

After a brief description of the magnitude and nature of floods in Indian rivers, the paper described the existing flood forecasting organization in the country and the proposed plans to augment its services. The occurrence of intense, short duration rainfall during the southwest monsoon period was examined with respect to the regions of occurrence, frequency, and magnitude. It was shown that the major portion of the country is subject to such intense rainfall with resulting flash floods. Because of the vast area and large number of streams subject to flash floods, many difficulties of a practical and financial nature are involved in providing an extensive warning system for flash floods in India. Mention was made of some flash floods which have occurred in the past few years and the damage they caused. Experience with radio-reporting rain gages as well as manned wireless reporting stations was briefly described. (See also W77-01933) (Humphreys-ISWS)
W77-01943

THE USE OF REMOTE SENSING SYSTEMS IN MONITORING DESERT FLOODS,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
For primary bibliographic entry see Field 7B.
W77-01944

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 7. LOWER MISSISSIPPI RIVER BASIN--VOLUME 1. LOWER MISSISSIPPI RIVER BASIN EXCEPT ARKANSAS RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-02009

ISOTOPIC HYDROLOGY IN THE AMAZONIA 2. RELATIVE DISCHARGES OF THE NEGRO AND SOLIMOES RIVERS THROUGH O-18 CONCENTRATIONS,
Centro de Energia Nuclear na Agricultura, Sao Paulo (Brazil); and Geological Survey, Denver, Colo.
E. Matsui, F. Salati, I. Friedman, and W. L. F. Brinkman.
Water Resources Research, Vol 12, No 4, p 781-785, August 1976. 4 fig, 2 tab, 15 ref.

Descriptors: *Streamflow, *Flow rates, *Oxygen isotopes, *Hydrology, *South America, *Precipitation(Atmospheric), Runoff, Sampling, Water analysis, Ion transport, Mixing, Tributaries.
Identifiers: *Amazon River, *Negro River, *Solimoes River.

Measurements of O-18 were made on samples of water collected during a 2-year period on the Amazon below the confluence of the Negro and Solimoes rivers. The measurements show that the Amazon is not completely mixed 120 km below the confluence. Estimates of relative flows were based on the O-18 concentrations and show that the relative contribution of the Negro varied from 19% in February 1973 to 68% in July 1973. (Woodard-USGS)
W77-02016

FLOOD CHARACTERISTICS OF STREAMS IN OWYHEE COUNTY, IDAHO,
Geological Survey, Boise, Idaho.
H. C. Riggs, and W. A. Harenberg.
Water-Resources Investigations 76-88 (open-file report), August 1976. 14 p, 3 fig, 1 tab, 8 ref.

Descriptors: *Flood discharge, *Flood forecasting, *Flood frequency, *Channel morphology, Peak discharge, Gaging stations, Flow measurement, Flood recurrence interval, Sites, Maps.
Identifiers: Owyhee County(Idaho).

Channel-width measurements were used to estimate annual peaks with a recurrence interval of 10 years at 79 sites in Owyhee County, Idaho, and adjacent areas. These discharges and those from 33 gaging stations are plotted on a map of the area. The map will allow the user to interpolate between sites. (Woodard-USGS)
W77-02027

WATER-TEMPERATURE CHANGES DOWNSTREAM FROM A MAJOR RESERVOIR AT CANNONSVILLE, N.Y.,
Geological Survey, Harrisburg, Pa., and Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W77-02030

HYDROLOGIC UNIT MAP--1974, STATE OF NORTH DAKOTA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-02031

WATER RESOURCES OF THE RAINY LAKE WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-02032

HYDROLOGICAL AND HYDRAULICAL CONCEPTUAL MODELS APPLICABLE TO OVERLAND AND RIVER TRANSPORT MODELING,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-02036

2F. Groundwater

HYDROCHEMISTRY AND GROUND-WATER MIXING IN PART OF THE LINCOLNSHIRE LIMESTONE AQUIFER, ENGLAND,
Birmingham Univ. (England). Dept. of Geological Sciences; and Birmingham Univ. (England). Hydrogeology Section.
A. R. Lawrence, J. W. Lloyd, and J. M. Marsh.
Ground Water, Vol. 14, No. 5, p 320-327, September-October 1976. 6 fig, 3 tab, 11 ref.

Descriptors: *Water chemistry, *Water types, *Mixing, *Connate water, Groundwater, Groundwater recharge, Carbon radioisotopes, Bicarbonates, Sulfates, Interfaces, Fissures(Geologic), Transmissivity, Potentiometric level, Water sampling, Water wells, Graphical analysis, Limestones, Ion exchange, Reduction(Chemical).
Identifiers: *Lincolnshire limestone(England).

A hydrochemical study was outlined which demonstrates the mixing of two different groundwater types in the Lincolnshire Limestone aquifer. The two water types consist of a modern recharge water and an ancient, possibly connate water. The hydrochemistry of the 'interface zone' between the two waters was discussed in detail. In the younger water, a relationship between sulphate reduction and bicarbonate was illustrated approaching the 'interface zone' and was considered to be related indirectly to the mixing. Carbon isotope content was shown to be radically different in the various groundwaters and to support the mixing hypothesis. (Visocky-ISWS)
W77-01627

HYDROLOGY AND CHEMISTRY OF GROUND WATER IN PUNA, HAWAII,
Colorado School of Mines, Golden. Dept. of Geology.
M. Druecker, and P-F. Fan.
Ground Water, Vol. 14, No. 5, p 328-338, September-October 1976. 7 fig, 4 tab, 15 ref. NSF GI 38319, ERDA E(04-3)-1093.

Descriptors: *Water chemistry, *Hydrogeology, *Hawaii, Groundwater movement, Test wells, Perched water, Water table, Groundwater barriers, Salinity, Water temperature, Saline water intrusion, Volcanoes, Permeability, Flow rates, Discharge(Water), Water types, Sodium chloride, Sampling, Silica, Depth, Mixing, Rainfall.
Identifiers: Dike water, Basal water, Rift zone, Superheated groundwater.

An analysis was presented of the hydrology and chemistry of the groundwater of the Puna District, Hawaii, based on data from 16 drilled wells, 10 test wells, 2 shafts, and 4 exploratory thermal wells. It was found that groundwater occurs as (1) perched water located north of Mountain View, (2) dike water located along the east rift zone of Kilauea, and (3) basal water occurring throughout most of the district, except where dike water is present. The east rift zone serves as a barrier to groundwater movement as demonstrated by the difference in basal water table levels on the two sides of the rift zone. Salinity and temperature of the basal groundwater vary greatly north and south of the rift zone due to differences in precipitation, sea water intrusion, volcanic activity, flow rates, permeability, and discharge. Basal groundwater type is predominantly sodium chloride. Water samples taken from thermal test well no. 3 showed dissolved silica values two to three times higher than the 49 mg/l average for the rest of the island. Hydrologic and geologic conditions in and around Kilauea's east rift zone support the possibility of accumulations of superheated groundwater. The mixing of waters of different composition at depth proved to be the most difficult problem encountered in estimating deep groundwater temperatures. (Visocky-ISWS)
W77-01628

TRANSIENT DRAINAGE WITH NONLINEARITY AND CAPILLARITY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
D. B. McWhorter, and H. R. Duke.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 102, No. IR2, Proceedings Paper 12185, p 193-204, June 1976. 4 fig, 1 tab, 10 ref, 2 append.

Descriptors: *Equations, *Drainage, *Drains, *Groundwater movement, *Unsaturated flow, Water table, Mathematical models, Unsteady flow, Mathematical studies, Flow.
Identifiers: Drainage equation, Transient drainage.

A nonlinear partial differential equation was developed that includes the effects of capillary storage and flow above the water table. An approximate analytic solution was derived. The water table response at the midpoint between drains affected by capillary storage, flow above the water table, and the nonlinearity due to decreasing flow depth was predicted by one relatively simple expression. Indices to the degree of importance of each of these three effects were defined. It was concluded that appropriate simplified forms of the solution can be selected based on the value of the indices. The method is applicable to a wide range of conditions including drains placed at any elevation relative to the impervious substratum and for shallow as well as deep water tables. The method removes three important restrictions necessarily imposed on the classical linear drainage equations but retains their familiar and desirable features. The equations are sufficiently simple to permit computations with a calculator and should be useful in routine design calculations. (Bhowmik-ISWS)
W77-01633

OBSERVATIONS ON THE DISTRIBUTION OF CALCIUM CARBONATE IN THE SOIL AND GROUND WATERS, (IN HUNGARIAN),
Hungarian State Geological Inst., Budapest.
For primary bibliographic entry see Field 2K.
W77-01733

ARTESIAN AQUIFERS,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 4B.
W77-01761

GROUND WATER FLOW IN UNCONSOLIDATED FORMATIONS,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 4B.
W77-01763

DRAWDOWN DUE TO PUMPING IN AN ANISOTROPIC AQUIFER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-01769

MONITORING GROUND-WATER QUALITY: METHODS AND COSTS,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01771

MONITORING GROUNDWATER QUALITY: ILLUSTRATIVE EXAMPLES.
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01772

PHYTOSOCIOLOGIC STUDY OF MANGROVES OF TULEAR REGION (MADAGASCAR). 4. PEDOLOGIC COMPLEMENTS RELATIVE TO MANGROVES OF SONGORITELO AND OF SAINT-AUGUSTIN, (IN FRENCH),
Aix-Marseille-1 Univ. (France). Laboratoire de Phytosociologie Cartographique.
For primary bibliographic entry see Field 2H.
W77-01888

DIFFERENTIAL-HEAD--LAKE-LEVEL RELATIONSHIPS IN THE MIDDLE-GULF AREA, FLORIDA,
Water and Air Research, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 4B.
W77-01922

DRAWDOWN DUE TO PUMPING IN AN ANISOTROPIC AQUIFER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-01929

AN ANALYSIS OF INSTABILITIES CAUSED BY SALINITY GRADIENTS IN GROUNDWATER,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-01931

A DRAWDOWN PREDICTION MODEL BASED ON REGRESSION ANALYSIS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W77-02015

BICARBONATE CONTENT OF GROUNDWATER IN CARBONATE ROCK IN EASTERN NORTH AMERICA,
Geological Survey, Menlo Park, Calif.; and Geological Survey, Raleigh, N. C.
For primary bibliographic entry see Field 2K.
W77-02020

EFFECT OF HIGH-PRESSURE DEFORMATION ON PERMEABILITY OF OTTAWA SAND,
Geological Survey, Menlo Park, Calif.
M. D. Zoback, and J. D. Byerlee.
American Association of Petroleum Geologists Bulletin, Vol 60, No 9, p 1531-1542, September 1976. 12 fig, 31 ref.

Descriptors: *Fluid mechanics, *Hydrostatic pressure, *Aquifers, *Permeability, *Oil fields, Geology, Secondary recovery(Oil), Pore pressure, Subsidence, Laboratory tests, Evaluation, Sands.
Identifiers: *Ottawa sand.

Because subsidence and permeability loss commonly are associated with fluid production from unconsolidated aquifers and reservoirs, there is an interest in the mechanical behavior and fluid-flow properties of granular materials under high pressure and stress. An understanding of such phenomena could directly influence both primary and secondary oil-recovery operations. This report discusses a series of high-pressure laboratory experiments investigating the deformation and fluid-flow properties of an Ottawa sand under hydrostatic confining pressure, triaxial compression, and triaxial extension. During deformation, permeability and pore-volume changes were measured periodically. The hydrostatic-compression tests bear on porosity and permeability changes that accompany either burial or formation pore-pressure changes associated with fluid withdrawal or injection. The triaxial-deformation experiments were performed to understand better the strength and deformational behavior of granular materials and to determine the permeability and pore-volume changes that accompany deformation. A section is included in which geologic applications of the experimental results are considered. (Woodard-USGS)
W77-02021

HYDROGEOLOGY OF A CAVERNOUS LIMESTONE TERRANE AND THE HYDROCHEMICAL MECHANISMS OF ITS FORMATION, MOHAWK RIVER BASIN, NEW YORK,
Geological Survey, Albany, N. Y.
V. R. Baker.
Empire State Geogram, Vol 12, No 2, p 2-65, 1976, New York State Education Department, Albany, p 2-65, 1976. 22 fig, 5 tab, 58 ref.

Descriptors: *Groundwater movement, *Hydrogeology, *Limestones, *Karst hydrology, Sinks, Caves, Aquifer characteristics, Hydrologic data, Evaluation.
Identifiers: *Mohawk River basin(NY), Schoharie County, Albany County.

The cavernous limestone terrane of the Mohawk River basin, northern Schoharie and western Albany Counties, N.Y., consists of plateaus underlain by southward-dipping limestone. Literature search of mechanisms suggests that the hydrochemical explanation for the permeability distribution in the limestone consists of four chronologic stages: (1) Beginning of groundwater movement in a fractured carbonate aquifer, (2) increase of permeability along bedding-plane fractures and vertical joints, a result of the 'fracture-breathing' phenomenon by which the permeability of an extremely tight fracture becomes a function of pore pressure, (3) transformation by hydraulic factors and by solution kinetics of small fractures into channels that eventually become cave conduits, and (4) integration of cave conduits into an efficient karst-drainage system. Karst drainage was further modified by the Pleistocene glaciation, which plugged some caves with sediment, blocked cave resurgences, and led to artesian conditions in the downdip parts of some cave-conduit systems. (Woodard-USGS)
W77-02022

GROUND-WATER RECORDS FOR SOUTHEASTERN OKLAHOMA: PART 1--RECORDS FOR WELLS, TEST-HOLES, AND SPRINGS,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 7C.
W77-02024

2G. Water In Soils

LAND DISPOSAL OF LIQUID SEWAGE SLUDGE: III. THE EFFECT ON SOIL NITRATE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5D.
W77-01557

CHROMIUM AND MERCURY IN A SOIL AFTER 80 YEARS OF TREATMENT WITH URBAN SEWAGE WATER, (IN GERMAN),
For primary bibliographic entry see Field 2K.
W77-01568

PHYTOTOXIC PROPERTIES OF ANAEROBIC BACTERIA OF IRRIGATED SOILS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
For primary bibliographic entry see Field 5C.
W77-01590

SOIL WATER CONTENT AND EVAPORATION DETERMINED BY THERMAL PARAMETERS OBTAINED FROM GROUND-BASED AND REMOTE MEASUREMENTS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. J. Reginato, S. B. Idso, J. F. Vedder, R. D. Jackson, and M. B. Blanchard.
Journal of Geophysical Research, Vol. 81, No. 9, p 1617-1620, March 20, 1976. 3 fig, 7 ref.

Descriptors: *Soil water, *Moisture content, *Remote sensing, Temperature, Soil temperature,

Evaporation, Infrared radiation, Aircraft, Soils, Measurement, Moisture, Drying, Thermal properties, Air temperature, Investigations, Irrigation, Agriculture.

Soil water contents from both smooth and rough bare soil were estimated from remotely sensed surface soil and air temperatures. An inverse relationship was found between two thermal parameters and gravimetric soil water content for Avondale loam when its water content was between air-dry and field capacity. These parameters, daily maximum minus minimum surface soil temperature and daily maximum soil minus air temperature, appeared to describe the relationship reasonably well. These two parameters also described relative soil water evaporation (actual/potential). Surface soil temperatures showed good agreement among three measurement techniques: in situ thermocouples, ground-based infrared radiation thermometer, and the thermal infrared band of an airborne multispectral scanner. (Sims-ISWS)
W77-01618

LABORATORY TESTING OF WATER-REPELLENT SOIL TREATMENTS FOR WATER HARVESTING,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 4D.
W77-01621

FIELD MAPPING SOIL CONDUCTIVITY TO DELINEATE DRYLAND SALINE SEEPS WITH FOUR-ELECTRODE TECHNIQUE,
Agricultural Research Service, Sidney, Mont.
A. D. Halvorson, and J. D. Rhoades.
Soil Science Society of America Journal, Vol. 40, No. 4, p 571-575, July-August 1976. 7 fig, 3 tab, 8 ref.

Descriptors: *Saline soils, *Conductivity, *On-site investigations, Arid lands, Salinity, Measurement, Salts, Groundwater, Seepage, Mapping, Soil water, Soils, Maps, Surveys, Soil science.
Identifiers: *Soil conductivity, *Saline seeps, Dryland salinity.

Continuing incidence of saline-seep areas in the northern Great Plains dryland soils has created a need for detecting and delineating encroaching saline seeps before plant growth is affected. This paper reported on an evaluation of the four-electrode conductivity technique for field mapping surface and subsurface soil salinity under dryland conditions. Results indicated that the four-electrode conductivity technique can be used successfully to quickly field map surface and subsurface soil salinity boundaries of existing and potential saline-seep areas. This technique also depicted underground flow patterns of a shallow, saline groundwater table. Maps of apparent bulk soil conductivity values were used to locate the position of the recharge area in relation to the discharge (seep) area. While maps of discrete depth interval conductivity values provided more precise information, the time required may not warrant the additional required calculations unless a portable programmable calculator is available. Mapping soil salinity with the four-electrode conductivity technique was easy, rapid, and relatively inexpensive. This technique provides information useful in making management decisions to prevent or alleviate a saline seep or other soil salinity problems. (Sims-ISWS)
W77-01622

ANALYTICAL SOLUTIONS OF A SIMPLIFIED FLOW EQUATION,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
P. A. C. Raats.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 4, p 683-689, July-August, 1976. 6 fig, 35 ref.

Descriptors: *Infiltration, *Soil water movement, *Hydraulic conductivity, *Moisture content, *Analytical techniques, Pressure head, Hydraulics, Soil physics, Model studies, Flow, Capillary action, Equations.
Identifiers: *Separation of variables, Damping factors, Perturbations.

Assuming that the hydraulic conductivity is an exponential function of the pressure head, a simplified flow equation was derived. The influence of hysteresis was ignored. The flow equation contained a constant that can be interpreted as a natural length of the soil and a function that delimits a natural time. Solutions of three special forms of the flow equation were discussed: (1) steady flows from point and line sources and to points and line sinks, (2) steady vertical flow, subject to distributed uptake by plant roots and a water table, and (3) transient redistribution following irrigation. All solutions presented hinge upon the exponential relationship between the hydraulic conductivity and the pressure head. The relationship was believed to be valid if the range of hydraulic conductivities is small. (Singh-ISWS)
W77-01624

PREDICTION OF INFILTRATION INTO LAYERED FIELD SOILS IN RELATION TO PROFILE CHARACTERISTICS,
Agricultural Research Service, Watkinsville, Ga.
R. R. Bruce, A. W. Thomas, and F. D. Whisler.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 4, p 693-698, 703, July-August 1976. 12 fig, 4 tab, 15 ref.

Descriptors: *Infiltration, *Soil profiles, *Soil classification, *Storms, *Soil horizons, *Pressure head, Soil moisture, Hydraulics, Porosity, Numerical analysis, Soil physics, On-site tests, *Forecasting.
Identifiers: *Layered soils, Grassy plots, B2 horizon.

An infiltration model based on flow theory was used to examine the effects of nature and extent of soil horizons in profiles of a clayey soil upon infiltration and soil water distribution. It was concluded that the characteristics and thickness of the surface soil horizon which overlies a subsoil of higher clay content and lower saturated hydraulic conductivity determine infiltration and consequent distribution of soil water during a significant period of a rainfall event. The period may vary from 10 to 40 minutes for high-intensity storms, depending upon initial soil water content, and for a longer period for dry soils and low-intensity storms. The B2 horizon of the soil tested begins to regulate infiltration after 30 to 40 minutes. The duration of these periods assumes insignificant effect of raindrop impact or wetting upon the surface hydraulic characteristics. The model adequately described infiltration into a grass covered plot. (Singh-ISWS)
W77-01625

OBSERVATIONS ON THE DISTRIBUTION OF CALCIUM CARBONATE IN THE SOIL AND GROUND WATERS, (IN HUNGARIAN),
Hungarian State Geological Inst., Budapest.
For primary bibliographic entry see Field 2K.
W77-01733

SOIL MOISTURE AND IRRIGATION STUDIES, II. PROCEEDINGS OF A PANEL.
Vienna, Austria, Nov. 2-6, 1970. 189 p. Brigitte Kaufmann, (Ed.). International Atomic Energy Agency: Vienna, Austria; (Dist. in U.S.A. by Unipub, Inc.: New York, N.Y.). 1973. Paper. Pr. $7.50.

Descriptors: *Crop production, *Soil-water-plant relationships, *Soil moisture, *Tracer techniques, *Crop response, Moisture content, Water utilization, Soil water movement, *Irrigation, Solutes, Isotope studies, Radiation, Water balance.
Identifiers: *Radiation techniques, Radiation equipment design.

Isotope and radiation techniques for increasing crop production leading to a better understanding of soil-water-plant relationships are examined. Progress in the design of relevant radiation equipment and the advantages and limitations of using such equipment in soil moisture and irrigation studies are discussed. The use of tracer techniques in the essential studies of water and solute movement under field conditions is described. Water balance in the field and plant response to irrigation, and the role that nuclear techniques can play in such investigations, are considered. Other topics include moisture measurement in thin soil layers, analysis of soil water and solute movement under field conditions and factors influencing the interpretation of soil-water-solute interactions, and field water balance and water use efficiency.--Copyright 1974, Biological Abstracts, Inc.
W77-01735

PORE PRESSURES NEAR MOVING UNDERWATER SLOPE,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 8D.
W77-01879

PHYTOSOCIOLOGIC STUDY OF MANGROVES OF TULEAR REGION (MADAGASCAR). 4. PEDOLOGIC COMPLEMENTS RELATIVE TO MANGROVES OF SONGORITELO AND OF SAINT-AUGUSTIN, (IN FRENCH),
Aix-Marseille-1 Univ. (France). Laboratoire de Phytosociologie Cartographique.
For primary bibliographic entry see Field 2H.
W77-01888

CO2 COMPENSATION POINT FOR PHOTOSYNTHESIS: EFFECT OF VARIABLE CO2 AND SOIL MOISTURE LEVELS,
Redlands Univ., Calif. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W77-01899

EFFECT OF SOIL MOISTURE ON NODULATION OF COWPEA AND HYACINTH BEAN,
Khartoum Univ., (Sudan). Faculty of Agriculture.
For primary bibliographic entry see Field 2I.
W77-01902

SOIL MOISTURE SURVEY EXPERIMENT AT PHOENIX, ARIZONA,
EG and G, Inc., Las Vegas, Nev. Las Vegas Area Operations.
E. L. Feimster, A. E. Fritzsche, and C. Jupiter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 122, Price codes: A03 in paper copy, A01 in microfiche. Report EGG-1183-1674, November 1975. 34 p, 6 fig, 6 tab, 1 append.

Descriptors: *Soil moisture, *Surveys, *Nuclear moisture meters, *Arizona, Aircraft, Remote sensing, Radiation, Gamma rays, Measurement, Equipment, Data collections, Data processing, Sampling.
Identifiers: *Phoenix(Ariz).

An aerial survey employing the measurement of natural terrestrial gamma radiation was carried out over farm lands east of Phoenix, Arizona, on March 18, 1975 by EG and G, Incorporated. The purpose of the survey was to determine soil moisture by detecting differences in the terrestrial gamma flux attenuation as a function of soil moisture content. The average soil moisture value for the 16-mile long survey line 1, derived from these aerial measurements was 21.5%, in good agreement with results from ground-based soil

sampling of 21.56%. Mile-by-mile averages of the aerial data ranged from 16.6% to 32.2%. This survey was carried out in order to offer an independent method of validating soil moisture data derived from aerial microwave and infrared measurements performed by the National Aeronautics and Space Administration. (Sims-ISWS)
W77-01914

SOIL MOISTURE IN THE BLACK RIVER BASIN, NEW YORK, DURING 1972-73, INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES (IFYGL),
Geological Survey, Albany, N. Y.
W. N. Embree.
Open-file report 76-543, August 1976. 33 p, 10 fig, 3 tab, 13 ref.

Descriptors: *Soil moisture, *Water storage, *Data collections, *Soil moisture meters, *New York, Hydrologic data, Snowmelt, Soil density, Porosity, Runoff, Hydrology.
Identifiers: *Black River basin(NY), International Field Year Great Lakes.

Soil-moisture data were collected and analyzed to provide an estimate of the quantity of water in temporary storage in the Black River Basin, New York, during the International Field Year for the Great Lakes (IFYGL) (April 1, 1972 to March 31, 1973). A portable neutron logger was used to record monthly soil-moisture profiles in the unsaturated zone at 11 sites in the basin. Moisture content, computed in inches of depth over the basin, ranged from 51.41 inches in April to 37.62 inches in August. Thickness of the unsaturated zone was greatest in April and was least in June. The observed absence of a pulse, or wave, of moisture moving down through the soil at most sites may be due to the infrequency of measurements, the location of sites in sandy, well-drained areas, and a relatively constant source of moisture (precipitation) at the surface. The study does not indicate a strong correlation between volume of snowmelt and soil-moisture; this may be due to the high porosity and permeability of soil material at the observation sites. Although nine pairs of monthly basin runoff and soil-moisture content data during IFYGL has a linear correlation coefficient of 0.82, too few data are available to develop a statistical relationship. (Woodard-USGS)
W77-02023

ARKANSAS RIVER WATER QUALITY RELATED TO THE IRRIGATION POTENTIAL OF ASSOCIATED SOILS,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-02065

2H. Lakes

VERTICAL DISTRIBUTION OF STRONTIUM-90 AND CESIUM-137 IN BOTTOM DEPOSITS OF RIVERS AND LAKES, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W77-01560

ALGAE OF THE LAKE CHAD REGION: I. GENERAL CHARACTERISTICS OF THE ENVIRONMENT, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de N'Djamena.
A. Iltis, and P. Compere.
Cah O R S T O M Ser Hydrobiol 8(3/4), p 141-164, 1974.

Descriptors: *Algae, *Lakes, Africa, Water chemistry, *Lake morphology, *Lake morphometry, Climates, Limnology, Water temperature, *Lake stages, Water levels.
Identifiers: Cameroons, Chad, Lake Niger, *Lake Chad.

A botanical study of lake Chad and its neighborhood was made by a team of the Jardin Botanique National de Belgique with the Office de la Recherche Scientifique et Technique Outre-Mer of Paris. The different diotopes of the lake, particularly in the eastern part, were studied. Lake Chad extends between 12 10'N and 13 and 15 30'E; during this study the lake area oscillated between 20,000-24000 km2. Various biotopes are included: free-waters, archipelago, 'Ilots-bancs' and swamps. The area id divided between Cameroons, Nigeria, Niger, Chad. The climate is subdesertic with a long dry season alternating with a rainy season of about 4 mo. The yearly average rainfall is about 330 mm on the lake. The water level undergoes variation in connection with the water supplied of the main tributary, the river Chari, and interannual variations may widely modify the area. The lake is shallow with an average depth of about 3.5 m. Water temperatures show 2 maxima, the 1st in June, the 2nd in Sept.; a slight minimum appears in Aug. during the rainy season and a 2nd, more important minimum, in Jan. The yearly average temperature is 27C. Transparency exceeded 1 m only in the terminal creeks of the archipelago and in zones where submerged vegetation was abundant. Conductivity varied from 60 micro m hos/cm in the delta of Chari to 800 micro m hos in the northern part of the lake; the isohalines curves are concentric to the delta. The measured pH ranged from 7.2-9.1. Water chemistry is dominated by CO3(H, SO4 and Cl being found in very small quantities. Four types of water are delimited in the lake by their cationic composition. The bottom is composed of mud, clay and said, vegetal detritus is often very abundant.--Copyright 1976, Biologial Abstract, Inc.
W77-01565

ASSESSMENT OF CADMIUM IN FISHES FROM CARINTHIAN LAKES, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W77-01593

CHARACTER OF INTERRELATIONS BETWEEN CHIRONOMIDAE AND THEIR PARASITES, MERMITHIDAE, (IN RUSSIAN),
Akademiya Nauk Moldavskoi SSR, Kishinev.
For primary bibliographic entry see Field 5C.
W77-01596

DYNAMICS OF THE PARASITE FAUNA OF DIFFERENT FORMS OF SALVELINUS ALPINUS L. FROM THE BASIN OF LAKE AZABACHJE, (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Institut Morskogo Biologii.
T. E. Butorina.
Parazitol (Leningr) 9(3), p 237-246, 1975.

Descriptors: *Animal parasites, Invertebrates, Aquatic animals, Nematodes, Trematodes, Protozoa, Lakes, Mollusks, Fish, Worms, Copepods.
Identifiers: Acanthocephala, Cestoda, Myxosporidia, Salvelinus-alpinus, Sarcodina, Sporozoa, USSR, *Chars, Lake Azabachje basin(USSR).

Age changes in the parasite fauna of different intraspecific forms of chars (S. alpinus) are discussed. The fauna include Sarcodina, Sporozoa, Ciliata, Trematoda, Cestoda, Nematoda, Acanthocephala, Mollsuca, and Copepoda. This year brood and yearlings of predatory, benthofagous, stream and anadromous chars up to 10 cm in length have a similar parasite fauna. During the second year of life the chars feed differently; their parasite fauna changes. Two groups of parasites are distinguished, infection with which increases and decreases with the age of fishes. Life cycles, development and maturation of some parasites of chars were studied. A shift in the developmental periods of helminths is noted as compared to those from the European part of the USSR.
W77-01597

CHLOROPHYLL DEGRADATION PRODUCT IN SEDIMENTS OF LAKE TEGA-NUMA, (IN JAPANESE),
For primary bibliographic entry see Field 5C.
W77-01604

THE MINERALOGY AND GEOCHEMISTRY OF THE SEDIMENTS OF NORTHWESTERN LAKE VICTORIA,
Lakehead Univ., Thunder Bay (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W77-01630

SOME CONSIDERATIONS ON THE ESTABLISHMENT OF THE HIGH AND LOW WATER LEVEL PLANES IN THE GREAT LAKES AREA,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
P-A. Bolduc.
Manuscript Report Series No. 38, 1975. 44 p, 10 fig, 8 tab, 4 ref.

Descriptors: *Great Lakes Region, *Great Lakes, *Lake stages, *Lake Ontario, *High water mark, *Low water mark, Water levels, Statistical methods, Monthly, Management, Regulation, Mathematical studies, Statistics, *Distribution patterns.
Identifiers: *Water level data, High water planes, Low water planes, Recording gages, Statistical studies.

Cumulative frequency distributions were used to determine the extreme and mean, maximum and minimum levels for Port Arthur, Goderich, Port Colborne, and Kingston. Daily means and the monthly maximums and minimums were processed in two groups: from 1916 to 1970, and from 1960 to 1970. For each of these periods and types of data, 6 different levels were determined from the non-exceedance percentages (5% and 95%, 3% and 97%, 1% and 99%). The monthly mean levels on each of the four Great Lakes were then used in the same fashion, and results were compared with the data obtained using the flood-routing technique. The influence of the regulation on Lake Ontario was shown. Finally, a technique was proposed to derive synthetic cumulative frequency distribution curves. (Roberts-ISWS)
W77-01637

COMPARATIVE HYDROECOLOGICAL AND ZOOLOGICAL INVESTIGATIONS IN SOME SUBMERGED PLANT STANDS OF LAKE VELENCE, (IN GERMAN),
Eotvos Lorand Univ., Budapest (Hungary). Inst. of Tiersystem.
S. Andrikovics.
Opusc Zool (Budap). 12(1/2), p 21-32, 1972.

Descriptors: *Water temperature, *Dissolved oxygen, *Fluctuations, *Hydrogen-ion concentration, *Correlation analysis, *Animal populations, Summer, Oxygen demand, Lakes, Diurnal, Aquatic microorganisms, *Submerged plants.
Identifiers: Chara sp, Cladophora fracta, Hungary, Myriophyllum spicatum, Potamogeton pectinatus, Utricularia vulgaris, *Lake Velence(Hungary).

The fluctuation of temperature, dissolved O2 and pH of 5 submerged stands in Lake Velence (Hungary) are described on the basis of daily collections made in summer. Meso- and macrofaunal organisms (61) are recorded from the lake. The animal aggregation of the greatest number of species populates the habitat of Utricularia vulgaris, then, in a decreasing sequence, stands of Chara sp., Potamogeton pectinatus, Cladophora fracta and Myriophyllum spicatum. The greatest number

of individuals occurred in the habitats of M. spicatum and P. pectinatus, followed by U. vulgaris, Chara sp. and C. fracta. Correlations between some dominant organisms and the daily phase fluctuation of dissolved O2 are shown.--Copyright 1975, Biological Abstracts, Inc.
W77-01658

PROCEEDINGS OF THE NATIONAL WETLAND CLASSIFICATION AND INVENTORY WORKSHOP, 1975.
Fish and Wildlife Service, Washington, D. C. Office of Biological Services.
For primary bibliographic entry see Field 4A.
W77-01682

RESEARCH NEEDS FOR THE LAKE TAHOE BASIN,
Lake Tahoe Area Research Coordination Board, South Lake Tahoe, Calif.
For primary bibliographic entry see Field 6G.
W77-01693

CERTAIN CHARACTERISTIC FEATURES OF FLOWERING AND POLLINATION IN DUCKWEEDS (LEMNACEAE S. GRAY),
For primary bibliographic entry see Field 4A.
W77-01778

ENVIRONMENTAL ASPECTS OF A LARGE TROPICAL RESERVOIR - A CASE STUDY OF VOLTA LAKE, GHANA.
Smithsonian Institution, Washington, D. C. Office of International and Environmental Programs.
For primary bibliographic entry see Field 5C.
W77-01779

WATER POLLUTION INVESTIGATION: ASHTABULA AREA,
Calspan Corp., Buffalo, N. Y.
For primary bibliographic entry see Field 5C.
W77-01780

NATIONAL EUTROPHICATION SURVEY METHODS 1973-1976.
National Environmental Research Center, Las Vegas, Nev. Monitoring Applications Lab.
For primary bibliographic entry see Field 5A.
W77-01787

NATIONAL EUTROPHICATION SURVEY: DATA ACQUISITION AND LABORATORY ANALYSIS SYSTEM FOR LAKE SAMPLES,
Environmental Monitoring and Support Lab., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W77-01788

PRE-IMPOUNDMENT BIOLOGICAL SURVEY OF STOCKTON RESERVOIR-SAC RIVER, MISSOURI, AUGUST 1968,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Field Investigations Branch.
For primary bibliographic entry see Field 5C.
W77-01793

BIOLOGICAL INVESTIGATIONS OF TUTTLE CREEK RESERVOIR, KANSAS,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Field Investigations Branch.
For primary bibliographic entry see Field 5C.
W77-01794

LIMNOLOGICAL STUDIES OF FLATHEAD LAKE, MONTANA: A STATUS REPORT,
Montana Univ., Missoula. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-01796

CHLOROPHYLL-A AND PRIMARY PRODUCTION IN GEORGIAN BAY, NORTH CHANNEL, AND LAKE HURON, APR. TO DEC. 1974,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-01798

SEASONAL ABUNDANCE AND HORIZONTAL DISTRIBUTION OF PLANKTONIC CRUSTEACEA OF GEORGIAN BAY,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-01799

A PRELIMINARY REPORT ON THE BENTHIC MACROINVERTEBRATES OF GEORGIAN BAY AND NORTH CHANNEL,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-01800

A PRELIMINARY REPORT ON THE BENTHIC MACROINVERTEBRATES OF LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-01801

1975 ANNUAL REPORT OF THE FRESHWATER BIOLOGICAL INVESTIGATION UNIT.
Northern Ireland Dept. of Agricultural, Antrim.
For primary bibliographic entry see Field 5C.
W77-01804

CHEMISTRY OF NEARSHORE SURFICIAL SEDIMENTS FROM SOUTHEASTERN LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W77-01805

WATER QUALITY BASELINE ASSESSMENT FOR CLEVELAND AREA--LAKE ERIE. VOL. II - THE FISHES OF THE CLEVELAND METROPOLITAN AREA INCLUDING THE LAKE ERIE SHORELINE,
John Carroll Univ., Cleveland, Ohio. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-01807

RECREATIONAL REUSE OF MUNCIPAL WASTEWATER -- PHASE II,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5D.
W77-01824

PHYTOSOCIOLOGIC STUDY OF MANGROVES OF TULEAR REGION (MADAGASCAR). 4. PEDOLOGIC COMPLEMENTS RELATIVE TO MANGROVES OF SONGORITELO AND OF SAINT-AUGUSTIN, (IN FRENCH),
Aix-Marseille-1 Univ. (France). Laboratoire de Phytosociologie Cartographique.
H. Weiss.
Tethys. 5(2/3), p 493-510, 1973.

Descriptors: *Soil analysis, *Connate water, *Vegetation effects, *Mangrove swamps, *Freshwater, *Groundwater, Brackish water, Surface-groundwater relationships, Potassium, Ions, Cations, Anions, Leaching.
Identifiers: Madagascar, Malagasy-republic, Songoritelo, St-Augustin, *Phytosociologic study, Tulear region.

Soil and interstitial water analyses were performed in relation to vegetation change. In spite of diverse results, common in brackish water, a relationship is shown between the development of the mangroves at Songoritelo and surface overflow of underground freshwaters. These waters are particularly rich in K+ and CO3H-. At St. Augustin, leaching of the soil seems to initiate evolution towards a soloth type.--Copyright 1975, Biological Abstracts, Inc. (See also W75-00443 and W73-13632)
W77-01888

LAKE SUPERIOR BATHYTHERMOGRAPH DATA,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
G. A. Leshkevich.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 826, Price codes: A05 in paper copy, A01 in microfiche. Report NOAA TM ERL GLERL-3, June 1975. 74 p, 3 fig, 2 tab.

Descriptors: *Lake Superior, *Water temperature, *Great Lakes, *Bathythermographs, On-site investigations, Lakes, Temperature, Sampling, Surveys, Ships, Winter, Equipment, Data processing, Data collections, Limnology, Data collections.

Water temperature profiles for a longitudinal cross section of Lake Superior were collected aboard vessels operated by the United States Steel Corporation during the 1972-73 and 1973-74 winter seasons. Seven cruises were made during this period, four during the first winter season and three during the second. This information was collected as part of the Great Lakes Environmental Research Laboratory's participation in the program to examine the feasibility of an extended navigation season on the Great Lakes and the St. Lawrence Seaway. The temperature profiles were made with a portable, expendable bathythermograph system and were taken at 30-minute to 1-hour intervals, resulting in 24 to 45 measurements per cruise. Temperature profile data from the surface to a maximum depth of 200 m (656.16 ft) were presented in tabular form for each cast. (Sims-ISWS)
W77-01912

DIFFERENTIAL-HEAD--LAKE-LEVEL RELATIONSHIPS IN THE MIDDLE-GULF AREA, FLORIDA,
Water and Air Research, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 4B.
W77-01922

PROBABILITY DISTRIBUTION OF CONCENTRATIONS MEASURED IN THE WAKE OF A CONTINUOUS POINT SOURCE IN COASTAL CURRENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
A. El-Shaarawi, and C. R. Murthy.
Journal of Physical Oceanography, Vol. 6, No. 5, p 735-740, September 1976. 6 fig, 3 tab, 8 ref.

Descriptors: *Model studies, *Currents(Water), *Dye concentrations, Coasts, Mathematical models, Statistical models, Distribution patterns, Waste disposal, Effluents, Turbulence, Lakes, Oceans, Flow, Limnology, Oceanography, *Lake Ontario.
Identifiers: *Coastal currents, Plumes.

A generalized statistical model was proposed to determine the probability density function of the concentration history measured at a fixed point in the wake of a continuous point source in coastal

currents. An application of the model using the experimental data indicated that the log-normal distribution is adequate from many practical problems. Some general statistical characteristics of the concentration field were computed from the model. (Sims-ISWS)
W77-01927

POSSIBILITIES FOR THE SYSTEMATIC ORGANIZATION OF AQUATIC BIRD HABITATS, (IN GERMAN),
For primary bibliographic entry see Field 5C.
W77-01950

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, GREAT LAKES-LAKE ERIE, (VOLUMES 1, 2, AND 3).
Dalton-Dalton-Little-Newport, Inc., Cleveland, Ohio.
For primary bibliographic entry see Field 5G.
W77-01979

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 7. LOWER MISSISSIPPI RIVER BASIN--VOLUME 1. LOWER MISSISSIPPI RIVER BASIN EXCEPT ARKANSAS RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-02009

NITROGEN AND PHOSPHORUS UPTAKE IN THE EVERGLADES CONSERVATION AREAS, FLORIDA, WITH SPECIAL REFERENCE TO THE EFFECTS OF BACKPUMPING RUNOFF,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W77-02012

CHEMICAL AND BIOLOGICAL QUALITY OF WATER IN PART OF THE EVERGLADES, SOUTHEASTERN FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W77-02013

KINETICS OF SILICON-LIMITED GROWTH IN THE FRESHWATER DIATOM ASTERIONELLA FORMOSA,
Michigan Univ., Ann Arbor. Div. of Biology.
For primary bibliographic entry see Field 5C.
W77-02035

STATEMENT OF CONCERNS OF THE LAKE MICHIGAN TOXIC SUBSTANCES COMMITTEE RELATED TO POLYCHLORINATED BIPHENYLS,
Environmental Protection Agency, Chicago, Ill.
For primary bibliographic entry see Field 5C.
W77-02038

APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF LAKE EUTROPHICATION IN THE GREAT LAKES BASIN,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5C.
W77-02041

APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF LAKE EUTROPHICATION IN THE GREAT LAKES BASIN,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5C.
W77-02042

FOOD SELECTION AND FEEDING RELATIONSHIPS OF YELLOW PERCH (PERCA FLAVESCENS MITCHELL), WHITE BASS (MONONE CHRYSOPS (RAFINESQUE)), FRESHWATER DRUM (APLODINOTUS GRUNNIENS (RAFINESQUE)), AND GOLDFISH (CARASSIUS AURATUS (LINNEAUS)), IN WESTERN LAKE ERIE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-02043

2I. Water In Plants

ROOT SYSTEM OF THE PEAR IN ARID ZONES, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Basis Agriculture.
I. M. Vashchenko.
Biol Nauki (Mosc) 18(6), p 60-64, 1975.

Descriptors: *Arid lands, *Root systems, Loam, Fruit crops, Orchards, Soils, Soil types.
Identifiers: Anthropogenic factor, Edaphic factors, *Pear, Root biomass, USSR, *Lower Don River area(USSR).

The root system of pears on the eroded and buried steppe loamy-sand soils of the Lower Don (USSR) was studied. The plasticity of the root system to edaphic and anthropogenic factors are most pronounced. A change of ecological conditions leads to a change of the spatial arrangement of the roots and their biomass. In arid steppes the bulk of the roots is concentrated in the 40-120 cm layer.
W77-01595

THE MOVEMENT OF SNOW-WATER THROUGH SMALL PLANT-SOIL SYSTEMS IN THE MEDICINE BOW MOUNTAINS, WYOMING,
Wyoming Univ., Laramie. Dept. of Botany.
For primary bibliographic entry see Field 2D.
W77-01812

SOME MOLECULAR MECHANISMS RETAINING WATER IN PLANT CELLS, (IN RUSSIAN),
Kazan Inst. of Biology (USSR).
A. A. Fedorova, and N. V. Sedykh.
S-Kh Biol 10(3), p 364-369, 1975.

Descriptors: *Systematics, Soybeans, Corn(Field), Beans, Peas, *Water availability, Water loss, *Moisture deficit, *Moisture uptake, *Dehydration, *Crops, Plant physiology.
Identifiers: Chick-pea, Millet, Plasmalemma.

The effect of the condition of intracellular water and plasmalemma on water-holding ability of soybean, millet, corn, pea vine, chick, pea and beans at normal water availability and water defiency was studied. The condition of intracellular water and plasmalemma affected water-holding ability of plants, the effect being different at different stages of dehydration.--Copyright 1976, Biological Abstracts, Inc.
W77-01881

CHANGES IN NITROGEN CONTENT IN PERENTIAL FORAGE GRASSES IN DIFFERENT GRASS MIXTURES, (IN AZERBAIJANI),
For primary bibliographic entry see Field 3F.
W77-01886

CO2 COMPENSATION POINT FOR PHOTOSYNTHESIS: EFFECT OF VARIABLE CO2 AND SOIL MOISTURE LEVELS,
Redlands Univ., Calif. Dept. of Biology.
P. Hurt, and R. Wright.
The American Midland Naturalist, Vol. 95, No. 2., p 450-455, April, 1976, 2 fig, 9 ref.

Descriptors: *Carbon dioxide, *Soil moisture, *Pine trees, *Moisture stress, *Photosynthesis, Light, Oxygen demand, Vegetation, Soil-water-plant relationships, Moisture content, Arid climates, Tension, Temperature.

Net photosynthesis of two species of pine seedlings was determined by carbon dioxide analysis under limiting conditions of soil moisture and carbon dioxide. It is known that soil moisture stress can have a detrimental effect on photosynthetic rates. Laboratory tests were conducted to examine increasing carbon dioxide levels and soil moisture tension to see how increased levels of carbon dioxide might effect the carbon dioxide compensation points of pine seedlings at certain water stresses. As the carbon dioxide limiting factor was removed by enhancement of atmospheric carbon dioxide, net photosynthesis increased even when soil water potential was low. Atmospheric carbon dioxide increase of considerable magnitude is a virtual certainty in coming years. Net photosynthesis of vegetation in dry climates will respond to this increase. (Jamail-Arizona)
W77-01899

RAINFALL INTERCEPTION BY COOL-DESERT SHRUBS,
Utah State Univ., Logan. Dept. of Range Science.
For primary bibliographic entry see Field 3B.
W77-01900

EFFECT OF SOIL MOISTURE ON NODULATION OF COWPEA AND HYACINTH BEAN,
Khartoum Univ., (Sudan). Faculty of Agriculture.
H. A. Habish, and A. A. Mahdi.
Journal of Agricultural Science, Vol 86, No. 3, p 553-560, June, 1976. 6 fig, 4 tab, 13 ref.

Descriptors: *Soil moisture, *Plant growth, *Legumes, *Beans, *Nitrogen fixation, Subtropic, Moisture content, Field capacity, Irrigation, Irrigation efficiency, Crops, Moisture deficit, Arid lands, Africa.
Identifiers: *Nodulation, *Cowpeas, *Sudan, *Hyacinth beans.

The effect of soil moisture on nodulation and growth of cowpea and hyacinth bean was investigated in pot and field experiments conducted in Sudan. Greenhouse experiments showed greater numbers of nodules at all levels of soil moisture in summer than in winter. The number and dry weight of cowpea and hyacinth bean were similarly affected by soil moisture. Poor nodulation of both crops at 15 percent soil moisture suggests that moisture is likely to limit nodulation of these legumes in the lighter soils of the rainlands where dryness occurs immediately after the end of the rainy season. Cowpea required less moisture than hyacinth bean for optimum nodulation and was thus more adapted to drier conditions. Experiments with irrigation showed that irrigating every 7 days gave better nodulation than irrigating every 14 days. This was attributed to the dry conditions which prevailed towards the end of the long watering interval. (Jamail-Arizona)
W77-01902

ABSCISIC ACID LEVEL IN TOMATO LEAVES AFTER A LONG PERIOD OF WILTING,
Aarhus Univ., (Denmark). Inst. of Plant Physiology.
O. S. Rasmussen.
Physiologia Plantarum, Vol. 36, No. 2., p 208-212, 1976. 4 fig, 3 tab, 18 ref.

Descriptors: *Moisture stress, *Soil-water-plant relationships, *Wilting point, *Water loss, *Leaves, Moisture availability, Moisture content, Transpiration, *Tomatoes, Water consumption, Acids, Gas chromatography, Plant growth, Adaptation.
Identifiers: *Abscisic acid.

The abscisic acid content was determined quantitatively in leaves from wilted and unwilted tomato plants by the use of the wheat coleoptile test and gas-liquid chromatography. Plants receiving an insufficient daily water supply for 18 days showed adaptation to wilting conditions, adjusting to added amounts of water by regulating water loss through transpiration. The concentration of abscisic acid was not higher in the leaves of plants adapted to water stress than in plants that were watered abundantly. Wilted detached leaves and leaves from rapidly wilted intact plants showed the well-known reaction by increasing the abscisic acid level. A possible role of abscisic acid in the early stages of the adptation process is discussed. (Jamail-Arizona)
W77-01906

RESPONSE OF COTTON TO NITROGEN AND WATER IN A TROPICAL ENVIRONMENT. III. FIBRE QUALITY,
Commonwealth Scientific and Industrial Research Organization, Kununurra (Australia). Div. of Land Research.
For primary bibliographic entry see Field 3F.
W77-01910

GROWTH OF CARP FRY UNDER EXPERIMENTAL CONDITIONS, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
L. A. Dobrinskaya, and T. V. Sled.
Ekologiya. 5(6), p 62-68, 1974.

Descriptors: *Growth stages, *Growth rates, *Fish, *Carp, *Fry, Size, Weight, Variability, *Fish stocking, Population, Aquaria.
Identifiers: Density, Metabolites, Fish growth.

Experiments were performed to determine the growth rate of carp fry (Cyprinus carpio) as a function of stocking density in aquaria. The 20-day-old carp fry (from 5-100) were kept in 30-l aquaria for 3 mo. The effect of metabolites excreted into the water on fry growth was studied. Three size subgroups are formed when fish of the same size and age are kept under relatively stable conditions in each aquarium. Data on th size, weight and variability of these indices are presented. The effect of metabolites is apparently one of the self-regulation mechanisms of growth, development and number of fish that can survive in the given system.--Copyright 1975, Biological Abstracts, Inc.
W77-02006

SIMULATION OF FOREST CHANGES RELATED TO HYDROLOGIC VARIABLES IN THE ATCHAFALAYA RIVER BASIN, LOUISIANA,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 4A.
W77-02019

PHYTOBENTHOS OF THE TEDZHEN FISH-BREEDING FARM, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Institut Botaniki.
Y. E. Lyubeznov.
Izv Akad Nauk Turkm SSR Ser Biol Nauk. 5 p, 28-23, 1974.

Descriptors: *Nutrients, *Nutrient requirements, *Algae, *Aquatic algae, *Fish farming, *Fish populations, Fish hatcheries, Productivity, Biomass.
Identifiers: Benthos, *Desmids, Mineral, Tedzhen, USSR, Turkmen SSR, *Phytobenthos.

The phytobenthos (algae, desmids) of 3 Tedzhen (Turkmen SSR, USSR) fish-hatcheries was investigated over a 2-yr period. The effect of fish-breeding measures on compsition and amount of fish was studied. Application of mineral nutrients increases the amount and biomass of phytobenthos 2-3 times.--Copyright 1975, Biological Abstracts, Inc.
W77-02034

QUALITATIVE AND QUANTITATIVE CHARACTERISTICS OF COMMERCIAL FISH OF THE SOLIGORSK RESERVOIR, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Dept. of Zoology and Parasitology.
T. M. Shawtsova, and A. M. Lyakh.
Vyestsi Akad Navuk BSSR Syer Biyal Navuk. 6, p 78-81, 1974.

Descriptors: *Fish, *Commercial fish, *Freshwater fish, *Fishing gear, *Fish populations, Fish harvest, Pikes, Perches, Carp.
Identifiers: *Species, Composition, Belorussian SSR, Bronze beam, Dace, Ide, Reservoir, Roach, Rudd, Ruff, Silver bream, Soligorsk, Tench, USSR.

Data are presented on the species composition (roach, pike, bronze bream, perch, carp, ruff, silver bream, ide, rudd, tench, dace) and the quantity of commercial fish in the Soligorsk Reservoir. On the basis of a 3-yr study (1971-1973) the proportion of each fish species in the catches is characterized by the year and month and the fishing gear used.--Copyright 1975, Biological Abstracts, Inc.
W77-02040

2J. Erosion and Sedimentation

VERTICAL DISTRIBUTION OF STRONTIUM-90 AND CESIUM-137 IN BOTTOM DEPOSITS OF RIVERS AND LAKES, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W77-01560

STOKES SETTLING AND DISSOLUTION RATE MODEL FOR MARINE PARTICLES AS A FUNCTION OF SIZE DISTRIBUTION,
Paris Univ. (France). Laboratoire d'Oceanographie Physique.
For primary bibliographic entry see Field 2L.
W77-01616

LABORATORY TESTING OF WATER-REPELLENT SOIL TREATMENTS FOR WATER HARVESTING,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 4D.
W77-01621

SEDIMENTARY MODEL FOR INTERTIDAL MUDFLAT CHANNELS, WITH EXAMPLES FROM THE SOLWAY FIRTH, SCOTLAND,
Leeds Univ. (England). Dept. of Earth Sciences; and Leeds Univ. (England). Div. of Geology.
For primary bibliographic entry see Field 2L.
W77-01629

THE MINERALOGY AND GEOCHEMISTRY OF THE SEDIMENTS OF NORTHWESTERN LAKE VICTORIA,
Lakehead Univ., Thunder Bay (Ontario). Dept. of Geology.
J. S. Mothersill.
Sedimentology, Vol. 23, No. 4, p 553-565, August 1976. 5 fig, 3 tab, 29 ref.

Descriptors: *Africa, *Sediments, *Mineralogy, *Lakes, *Lake sediments, Geochemistry, Sands, Silts, Clays, Organic matter, Photosynthesis.
Identifiers: *Lake Victoria(Africa), Plagioclase, Kaolinite, Illite, Vermiculite, Varimax matrix determinations.

In the nearshore area of northwestern Lake Victoria, a thin strip of quartzarenite sand occurs which grades lakeward into silty clay consisting of quartz with subordinate amounts of K-feldspar, plagioclase, kaolinite, illite, vermiculite, and organic matter. Varimax matrix determinations of the element concentrations in the lake-bottom sediments extractable by aqua regia indicated that: (1) there is a strong association of Cr, Cu, Zn and Ni; (2) there is a strong association of Fe, Mn, and Co; (3) Cu and Ni show moderate to slight associations with organic matter; and (4) Ca is relatively independent of the other elements. It was learned that the general decrease in the pH values of the surface and bottom waters outward from the lake shore, with consistently higher values for the surface water relative to the bottom waters, results from decreasing levels of photosynthetic ctivity. (Lee-ISWS)
W77-01630

IMPACT OF WATER RESOURCE DEVELOPMENT ON COASTAL EROSION, BRAZOS RIVER, TEXAS,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W77-01681

USE OF OUTER BARS OF INLETS AS SOURCES OF BEACH NOURISHMENT MATERIAL,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
For primary bibliographic entry see Field 2L.
W77-01708

CHEMISTRY OF NEARSHORE SURFICIAL SEDIMENTS FROM SOUTHEASTERN LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W77-01805

A STOCHASTIC SEDIMENT YIELD MODEL FOR BAYESIAN DECISION ANALYSIS APPLIED TO MULTIPURPOSE RESERVOIR DESIGN,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 4D.
W77-01892

DUST STORMS,
For primary bibliographic entry see Field 2B.
W77-01895

RAINFALL EROSIVITY OVER RHODESIA.
Rhodesia Univ., Salisbury. Dept. of Geography.
M. A. Stocking, and H. A. Elwell.
Transactions, Institute of British Geographers, Vol. 1, No. 2., p 231-245, 1976. 9 fig, 4 tab, 22 ref.

Descriptors: *Soil erosion, *Storm runoff, *Storm water, *Rainfall, *Rainfall-runoff relationships, Precipitation(Atmospheric), Vegetation effects, Erosion, Rain, Surface runoff, Storms, Impact(Rainfall), Subtropic, Air-earth interfaces, Soil types, Kinetics, Energy, Africa.
Identifiers: *Erosivity, *Rhodesia.

The erosive potential of rainfall, 'erosivity', is discussed. Using bare soil as a standard, a measure linking kinetic energy and a maximum sustained intensity is found to be the most generally applicable erosivity parameter over Rhodesia. This is consistent with American findings. Data for 8000 storms show that erosivity varies much more widely between years than mean annual rainfall and that on a yearly basis there is no relationship between the two. Of more significance to the ero-

sion process is the finding that many stations, especially in the lower rainfall areas, have a higher proportion of erosive storms in the early rainy season when vegetation cover is poor. A relationship is established between long-term mean annual rainfall and erosivity which is used to construct a composite erosivity map of Rhodesia for the use of conservation planners and as an extension aid. (Jamail-Arizona)
W77-01901

CALCIUM CARBONATE DISTRIBUTION IN THE SURFACE SEDIMENTS OF THE INDIAN OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2L.
W77-01919

HYDRAULIC PERFORMANCE OF FLUMES FOR MEASUREMENT OF SEDIMENT-LADEN FLASH FLOODS,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2E.
W77-01935

EQUILIBRIUM CONDITIONS AND SEDIMENT TRANSPORT IN AN EPHEMERAL MOUNTAIN STREAM,
Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
B. H. Heede.
In: Volume 6. Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1976 Annual Meeting of Arizona Section, AWRA and the Hydrology Section, AAS (April 28-May 1), Tucson, Arizona. p 97-102, 3 fig, 3 ref.

Descriptors: *Geomorphology, *Channel morphology, *Equilibrium, *Sedimentation, *Arizona, *Sediment transport.
Identifiers: Mountain streams, Bed form, Gravel bars, Hydraulic geometry, Flow frequency.

Flow frequency curves supported the hypothesis that channel-forming flows are exceptional events in ephemeral mountain streams. This was substantiated by the lack of a relationship between sediment production and sediment yield. Numerous bed nickpoints indicated channel instability, despite gravel bars and log steps that are part of the slope adjustment processes. Due to differences in structural density between bars and steps, size distribution of the sediment deposits above them differs. Although only qualitative guidelines are presented, the watershed or wildlife manager should be in a position to utilize the formation of gravel bars and log steps for management goals. (Forest Service)
W77-01951

SOUTHEASTERN FORESTS AND THE PROBLEM OF NON-POINT SOURCES OF WATER POLLUTION,
Forest Service (USDA), Franklin, N. C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 5B.
W77-01952

2K. Chemical Processes

SOME ASPECTS OF NUCLEAR SPIN RELAXATION OF ADSORBED WATER PROTONS IN BIOLOGICAL MATRICES, (IN RUSSIAN),
Institut Fiziki, Krasnoyarsk (USSR).
For primary bibliographic entry see Field 5A.
W77-01563

SOME ASPECTS OF NUCLEAR SPIN RELAXATION OF WATER ADSORBATE PROTONS IN BIOLOGICAL MATRICES, (IN RUSSIAN),
Institut Fiziki, Krasnoyarsk (USSR).
For primary bibliographic entry see Field 5A.
W77-01564

CHROMIUM AND MERCURY IN A SOIL AFTER 80 YEARS OF TREATMENT WITH URBAN SEWAGE WATER, (IN GERMAN),
N. El-Bassam, P. Poelstra, and M. J. Frissel.
Z Pflanzenernaehr Bodenkd 3, p 309-316, 1975.

Descriptors: *Chromium, *Mercury, Soil analysis, *Soil treatment, *Sewage, Municipal wastes, Adsorption, Groundwater, Anaerobic conditions, Water pollution.

A soil irrigated with sewage water for 80 yr contains 112 ppm Cr and 1.5 ppm Hg. The sewage water presently contains 0.07 ppm Cr and 0.002 ppm Hg. To study the migration and leaching of Cr in the soil experiments were done with 51 Cr as Cr3- under anaerobic conditions in undisturbed soil columns. In all cases Cr was adsorbed in the layer 0-5 cm. Similar experiments with 203 Hg as HgCl2 showed that Hg is adsorbed near the surface. Neither Cr nor Hg contaminated the ground water.
W77-01568

HYDROCHEMISTRY AND GROUND-WATER MIXING IN PART OF THE LINCOLNSHIRE LIMESTONE AQUIFER, ENGLAND,
Birmingham Univ. (England). Dept. of Geological Sciences; and Birmingham Univ. (England). Hydrogeology Section.
For primary bibliographic entry see Field 2F.
W77-01627

HYDROLOGY AND CHEMISTRY OF GROUND WATER IN PUNA, HAWAII,
Colorado School of Mines, Golden. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W77-01628

PERFORMANCE CHARACTERISTICS FOR THE SPECTROPHOTOMETRIC DETERMINATION OF TOTAL IRON IN FRESHWATER USING HYDROCHLORIC ACID,
Freshwater Biological Association, Windermere (England).
For primary bibliographic entry see Field 5A.
W77-01642

ANNUAL BOOK OF ASTM STANDARDS. PART 31: WATER,
For primary bibliographic entry see Field 5A.
W77-01662

OBSERVATIONS ON THE DISTRIBUTION OF CALCIUM CARBONATE IN THE SOIL AND GROUND WATERS, (IN HUNGARIAN),
Hungarian State Geological Inst., Budapest.
A. Ronai.
Magy All Foldtani Intez Evi Jel., 1971, p 123-139, 1973.

Descriptors: *Groundwater, Soil water, *Calcium carbonate, Calcium compounds, *Water pollution, *Soil contamination, *Sampling, *Distribution.
Identifiers: *Hungary.

The distribution of CaCO3 in the soil, the subsoil and the ground waters shows many interesting varieties in the Alfold's lowland areas (Hungary). The territory was explored by 10m-deep boreholes located in a regular grid. The territory under consideration is the interfluve of the Tisza and Koros rivers, the region of C songrad-Tiszfoldvar. In the inter-mound depressions of the western areas of the Tisza the accumulation of CaCO3 on the surface and underground is considerable, and the longitudinal depressions are lined with fine lacustrine chalk in several places. To the east of the Tisza, the loess areas further away from the rivers are rich in lime. The CaCO3 content of the ground waters does not exhibit a distribution of this kind. The highest quantities of calcium hydrocarbonate can be found in ground waters close to the rivers while in the more remote areas this mineral is rather poor. Accordingly, the distribution pattern is almost the reverse of the conditions existing in the soil. This phenomenon seems to be due the slow, river-bound subsurface flow of the ground waters and to the large-scale evaporation occurring on the flat flood plains. A 2nd reason consists in the Ca-Na exchange between soil and ground water. The vertical distribution of CaCO3 in the soil strata is shown. The sand mounds west of the Tisza are very abundant in CaCO3 even at depths of 7 to 10 m underground. On the flood plains of the rivers to the east of the Tisza there are leached limeless soils and even in the loess areas farther away from the rivers it is only in the accumulation horizon below the top soil layer that lime is abundant. The ground waters leach the strata during the vertical oscillations of their table and they keep the dissolved salts in permanent motion. The amplitude of oscillations defines the thickness of the strata involved in leaching. The quantity of leachable salts, however, depends on the granulometric composition of the strata. Fine-grained strata (silt, clay, sand flour) contain greater amount of leachable substance, though the rate of leaching is slow. Leaching in coarse-grained sediments (sands) is rapid, though the quantity of water-soluble substances is low. The variation of the CaCO3 content of the soil and ground water and the zone of ground water oscillations are shown in 3 geological sections.--Copyright 1974, Biological Abstracts, Inc.
W77-01733

SHALLOW GROUND-WATER SALINIZATION IN DRYLAND FARM AREAS OF MONTANA,
Montana Univ., Missoula. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-01822

THE EFFECT OF THE NON-IDEAL COMPOSITION OF SEA WATER ON SALINITY AND DENSITY,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2L.
W77-01911

A STUDY OF MOLECULAR PARAMETERS INFLUENCING POLYMER DRAG REDUCTION,
Naval Underseas Center, San Diego, Calif.
For primary bibliographic entry see Field 8B.
W77-01915

BICARBONATE CONTENT OF GROUNDWATER IN CARBONATE ROCK IN EASTERN NORTH AMERICA,
Geological Survey, Menlo Park, Calif.; and Geological Survey, Raleigh, N. C.
F. W. Trainer, and R. C. Heath.
Journal of Hydrology, Vol 31, No 1/2, p 37-55, September 1976. 3 fig, 2 tab, 37 ref.

Descriptors: *Bicarbonates, *Groundwater, *Carbonate rocks, *Aqueous solutions, Carbon dioxide, Vegetation, Soils, Percolating water, Limestones, Karst hydrology, Hydrogeology, Water chemistry, North America, Puerto Rico.
Identifiers: *Eastern North America, Yucatan.

In carbonate-rock terrane the most effective solution occurs where soil and vegetative cover facilitate biogenic production and storage of CO2 in the soil until part of it is carried downward in percolating water. Bicarbonate data for groundwater in eastern North America are examined in

the light of these conditions, of the CO2 content of soil gas, and of the timing of groundwater recharge relative to seasonal changes in soil temperature. There appears to be no well-marked relation between latitude and bicarbonate content of groundwater in this region. Interplay of all the factors listed above, and of lithology and soil types, is evidently such that under optimum conditions the amount of solution of carbonate rock is roughly comparable, per unit of groundwater recharge, over the region from Ohio to Florida (and, perhaps, to Puerto Rico and Yucatan). Relatively low HCO3 concentrations observed in much of the southern United States are attributed to low production and storage of CO2 in sandy soil that is poor in organic matter. On the other hand, concentrations observed in Ontario, New York and Michigan are markedly higher than is to be expected from interrelations of the factors considered. These high values, apparently anomalous, are attributed in part to solution of granular glacial drift derived largely from carbonate rock. (Woodard-USGS)
W77-02020

2L. Estuaries

EFFECTS OF CADMIUM AND LEAD UPON THE INDIGENOUS HETEROTROPHIC MICROFLORA IN THE AQUEOUS ENVIRONMENT OF THE BRACKISH ESTUARY-WATER OF THE RIVER WESER, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5C.
W77-01566

STUDY ON THE CHARACTERISTIC DISTRIBUTION OF PHOSPHATE IN JUNHAE BAY, (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
For primary bibliographic entry see Field 5B.
W77-01571

WATER QUALITY OF THE CULTURE BEDS OF HARD CLAM AND ADJACENT SEA OF THE YEOSU REFINERY OF HONAM OIL REFINERY COMPANY IN KWANG YANG BAY, (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
For primary bibliographic entry see Field 5C.
W77-01572

SURFACE WATER POLLUTION-THE CATCHMENT AREA AT SANDEFJORD, (IN NORWEGIAN),
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5B.
W77-01587

PHYTOPLANKTON DISTRIBUTION IN THE SCOTIA SEA AS RELATED TO VERTICAL WATER CIRCULATION, (IN RUSSIAN),
All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
For primary bibliographic entry see Field 5B.
W77-01592

ABYSSAL CIRCULATION OF THE SOUTHEASTERN PACIFIC AND SOME GEOLOGICAL IMPLICATIONS,
Scripps Institution of Oceanography, San Diego, Calif. Marine Physical Lab.
P. Lonsdale.
Journal of the Geophysical Research, Vol. 81, No. 6, p 1163-1176, February 20, 1976. 14 fig, 55 ref. NSF DES74-20396.

Descriptors: *Circulation, *Ocean circulation, *Currents(Water), *Pacific Ocean, Water circulation, Temperature, Water temperature, Salinity, Hypolimnion, Geology, Basins, Oceans, Erosion, Sediment transport, Sediments, Mixing, Oceanography.
Identifiers: *Chile, *Peru, *Panama, *Guatemala, *Abyssal circulation, Thermohaline currents, Bottom circulation.

The abyssal circulation of the Pacific Ocean east of the East Pacific Rise was deduced from hydrographic data, supported by a few direct current measurements. Two main flow paths were recognized: across the Chile Rise into the Chile Basin, and thence northward into the Peru Basin and Panama Basin; and eastward across the East Pacific Rise into the Guatemala Basin and into Bauer Basin. The following conditions were found to exist: Transform fault troughs are important passages allowing flow across the rises, and the Peru-Chile Trench is the principal channel for inflow to the Peru and Panama basins. The deep water that flows across the East Pacific Rise near the equator has a similar temperature structure to that in the southern Chile Basin, but it is less saline and has lower oxygen concentrations. Along both flow paths the bottom waters become warmer, less saline, and less oxygenated as a result of vertical mixing (intensified near sills), geothermal heating (concentrated at active spreading centers), and in situ decay of organic matter (especially beneath productive surface waters). The regional pattern of abyssal circulation may partly control the distribution of metalliferous pelagic sediments (including both fine-grained precipitates and manganese nodules) and the rates of dissolution of calcareous sediments. Where the deep thermohaline flow is accelerated in narrow passage between basins, it has deeply eroded the sea floor and transports sediment as bed load. Steady currents measured in one of these passages exceeded 30 cm/s. (Sims-ISWS)
W77-01611

THE DENSITY OF ARTIFICIAL RIVER AND ESTUARINE WATERS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
F. J. Millero, D. Lawson, and A. Gonzalez.
Journal of Geophysical Research, Vol. 81, No. 6, p 1177-1179, February 20, 1976. 4 tab, 29 ref. ONR N00014-75-C-0173, NSF GA-40532.

Descriptors: *Estuaries, *Rivers, *Density, Mixing, Saline water-freshwater interfaces, Model studies, Mathematical models, Equations, Laboratory tests, Physical properties, Chemical properties, Dissolved solids, Coasts, Sea water, Salinity.
Identifiers: *Artificial estuaries, *Artificial rivers.

The densities of an artificial estuary formed by mixing artificial average river water with standard seawater have been measured with a vibrating densimeter at 25 C. The densimeter was calibrated by measuring the densities of weight evaporated and diluted (with pure water) standard seawater solutions. The measured seawater densities agreed with those determined from the equation of state of Millero, et al, to plus or minus 2 ppm. The densities of the artificial river waters were found to be in good agreement (4.2 ppm) with those determined by using apparent equivalent volume data for the major river components. The densities of the artificial river and the estuarine waters were found to be in excellent agreement (plus or minus 1.6 ppm) with the densities of seawater solutions (diluted with pure water) at the same total solid concentration or salinity. These results confirmed the theoretical calculations of Millero and indicated that the densities of rivers and estuaries can be determined from the equation of state of seawater diluted with pure water. (Sims-ISWS)
W77-01612

TEMPERATURE AND SALINITY MICROSTRUCTURE IN THE PACIFIC EQUATORIAL UNDERCURRENT,
Scripps Inst. of Oceanography, La Jolla, Calif.
M. C. Gregg.
Journal of Geophysical Research, Vol. 81, No. 6, p 1180-1196, February 20, 1976. 11 fig, 2 tab, 14 ref. ONR N00014-69-A-0200-6049, ONR N00017-69-0200-6039.

Descriptors: *Oceans, *Salinity, *Density, *Water temperature, *Pacific Ocean, Physical properties, On-site investigations, Temperature, Thermocline, Fluctuations, Mixing, Turbulence, Heat transfer, Oceanography.
Identifiers: *Microstructure, *Pacific equatorial undercurrent, Cox number.

In July 1972, six microstructure profiles were taken on the equator at 155 deg W. The rate of dissipation of the temperature fluctuations was high, but not exceptional. A region of intense microstructure activity was found from 35 to 65 m, well above the velocity maximum. Sharp instabilities were found with vertical scales of less than 1 m in this region. The average Cox number was greater than 3300, implying the presence of intense vertical turbulence. By comparison, the profile in the vicinity of the velocity maximum, about 110 m, had an average Cox number of about 40 and a much less active appearance, which is consistent with weak vertical turbulence. A very well developed, nearly isothermal region between 300 and 400 m, the thermostad, was found to have a Cox number of about 100 because of moderate levels of microstructure activity. The thermostad was stable over scales of 10 m but not over scales of 1 m. Below the thermostad, the mean Cox number was no more than 20, and the temperature profile had an appearance similar to that of monotonic records from other locations. The general pattern of vertical turbulence found was consistent with the 10-m-scale Richardson number values of Jones and with the values of the vertical turbulent viscosity used in a model by Robinson. (Sims-ISWS)
W77-01613

LONG-RANGE ECHO SOUNDING WITH A CHIRP SOURCE,
Woods Hole Oceanographic Institution, Mass. Dept. of Ocean Engineering.
M. H. Orr, R. C. Spindel, and R. P. Porter.
Journal of Geophysical Research, Vol. 81, No. 6, p 1197-1200, February 20, 1976. 9 fig, 8 ref. ONR N00014-70-C-0205.

Descriptors: *Remote sensing, *Oceans, *Acoustics, *Atlantic Ocean, Equipment, Instrumentation, Investigations, Sounding, Sound waves, Bathymetry, Measurement, Mapping, Sonar, Surveys, Oceanography.
Identifiers: *Echo sounding, *Blake escarpment, Chirp sources.

An experiment was performed to determine the applicability of coherent signal processing techniques to a long-range, low-frequency, side-looking bathymetric survey system. A linear FM sweep of 280-Hz center frequency, 10-Hz bandwidth, and 20-s duration was produced by a source at depths between 120 and 150 m towed parallel to the Blake escarpment at a range of about 250 km. Reflected signals were received by a line array towed at depths ranging from 765 to 825 m. The received signals were passed through a digital pulse compressor and averaged. Groups of the received signals were easily identified as reflections from the Blake escarpment. The experiment showed that coherent signal processing techniques are applicable to low-frequency, side-looking bathymetric survey systems. (Sims-ISWS)
W77-01614

VERTICAL PROFILES OF TEMPERATURE AND FINE-SCALE VELOCITY STRUCTURE IN THE THERMOCLINE,
Hawaii Univ. Honolulu. Dept. of Oceanography.
B. Gallagher.
Journal of Geophysical Research, Vol. 81, No. 6, p 1201-1206, February 20, 1976. 7 fig, 8 ref. NSF GA-1243.

Descriptors: *Water temperature, *Velocity, *Oceans, *Pacific Ocean, On-site investigations, Temperature, Measurement, Mixing, Turbulence, Fluctuations, Instrumentation, Investigations, Oceanography.
Identifiers: *Microstructure, Fine-scale velocity structure.

Temperature and fine-scale velocity structure were measured in vertical profiles extending from the sea surface down through the main thermocline near Oahu, Hawaii. From 10 to 20% of the upper water column contained small-scale velocity fluctuations, which were present in discrete vertical patches or events. The amount of activity was greatest within the thermocline. Typical velocity fluctuations within events ranged from 0.1 to 1.0 cm/s, vertical wavelengths ranging from from 5.0 to 50 cm. There was correlation between the form of the velocity flutuations and the surrounding thermal structure; larger-scale motions corresponded with higher temperature gradients. (Sims-ISWS)
W77-01615

STOKES SETTLING AND DISSOLUTION RATE MODEL FOR MARINE PARTICLES AS A FUNCTION OF SIZE DISTRIBUTION,
Paris Univ. (France). Laboratoire d'Oceanographie Physique.
J-C. Brun-Cottan.
Journal of Geophysical Research, Vol. 81, No. 9, p 1601-1606, March 20, 1976. 6 fig, 1 tab, 22 ref.

Descriptors: *Settling velocity, *Particle size, *Oceans, *Model studies, Mathematical models, Rates, Sediments, Deposition(Sediments), Suspended solids, Solubility, Physical properties, Stokes law, Sedimentation rates, Sedimentation, Oceanography.
Identifiers: *Dissolution rate, *Marine particles.

A critical analysis of a Stokes settling model for marine particles which takes into account dissolution rate, density, size distribution of the particles, and velocity of vertical advection was proposed. The dissolution rate was considered proportional to the diameter, surface area, or volume of the particles. Coefficients of the model were calculated exclusively from particle size measurements made in 1971-1972 in the western Mediterranean and the Guinea Basin with a modified Coulter counter. The variation of diameters and the settling rates of particles with depth were calculated in a defined surface water column taken between 300 and 800 m to match actual conditions. Known values of the dissolution rate of calcite particles in seawater were used to test the model coefficients. The theoretical influence of dissolution on concentration and size distribution of marine particles was evaluated. Comparison of the model values with weight and particle size data in this depth interval indicated that Stokes settling only applies to particles with sizes greater than 4-5 micrometers. (Sims-ISWS)
W77-01616

THE TIDES OF THE EAST RIVER, NEW YORK,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
M. J. Bowman.
Journal of Geophysical Research, Vol. 81, No. 9, p 1609-1616, March 20, 1976. 11 fig, 3 tab, 21 ref.

Descriptors: *Tides, *Tidal waters, *Estuaries, *New York, Circulation, Water circulation, Tidal effects, Fluctuations, Frequency, Waves(Water), Currents(Water), Hydrodynamics, Model studies, Mathematical models, On-site investigations, Rivers.
Identifiers: *East River(NY), *Long Island Sound(NY).

The East River, New York, is a co-oscillating tidal strait connecting New York Harbor to western Long Island Sound. Linear wave theory was applied to the river in an attempt to interpret the tidal characteristics. The theory accurately described the observed longitudinal variation in amplitude of the tidal current, but the simple model used did not adequately predict the amplitudes of the tidal heights or the overtides. The frictional resistance to flow through the river was characterized by an effective value of De Chezy's coefficient of approximately 26 (m to the 1/2 power)/s. Tidal current records gathered over a 5-day period from a linear array placed across the Upper East River were analyzed to investigate the harmonic content of the tidal transport. The semidiurnal frequency and its third harmonic were dominant. (Sims-ISWS)
W77-01617

CHARACTERISTICS OF A TIDE-INDUCED ESTUARINE FRONT,
McGill Univ., Montreal (Quebec). Marine Sciences Centre.
R. G. Ingram.
Journal of Geophysical Research, Vol. 81, No. 12, p 1951-1959, April 20, 1976. 11 fig, 14 ref.

Descriptors: *Tides, *Estuaries, *St. Lawrence River, *Canada, On-site investigations, Aerial photography, Rivers, Turbidity, Flow, Tidal bores, Tidal waters, Velocity, Temperature, Water temperature, Salinity, Density, Measurement.
Identifiers: *Fronts(Water).

Characteristics of a dynamic front over the Ile Rouge Bank in the Saint Lawrence estuary were discussed. It was shown that an advancing front, exhibiting both a large density gradient and a convergent surface flow, is generated during each semidiurnal tide cycle. Frontal advance occurs just after high tide on the northern shore. During retreat, frontlike characteristics were not observed. (Sims-ISWS).
W77-01619

ON POLARIZATION FEATURES OF RADIO SIGNALS SCATTERED FROM THE SEA SURFACE AT SMALL GRAZING ANGLES,
Akademiya Nauk URSR, Kharkov. Inst. of Radio-Physics and Electronics.
A. I. Kalmykov, and V. V. Pustovoytenko.
Journal of Geophysical Research, Vol. 81, No. 12, p 1960-1964, April 20, 1976. 9 fig, 9 ref.

Descriptors: *Radio waves, *Radar, *Waves(Water), Model studies, Mathematical models, On-site investigations, Radiation, Measurement, Oceans, Oceanography, Electrical engineering.
Identifiers: *Polarization, Scatttering, Backscatter, Sea surfaces, Radio signals, Cross polarization.

Measured results were presented of the amplitude and spectral characteristics of the envelopes of vertically and horizontally polarized and cross-polarized 3.2-cm radar backscatter signals from the surface of the sea at grazing angles less than 8 deg with fine range resolution. The features of scattering on vertical polarization were explained completely by the 'two-scale' model. For horizontal polarization, relatively stable backscatter signals, called 'bursts,' were observed in addition to the signals scattered by the capillary waves. The results were also used to explain features of the fading spectra of the signals for the different polarizations. (Sims-ISWS)
W77-01620

QUALITY OF GROUND WATER IN THE COASTAL AQUIFER NEAR VISAKHAPATNAM, INDIA,
Andhra Univ., Waltair (India). Dept. of Geophysics.
For primary bibliographic entry see Field 5B.
W77-01626

SEDIMENTARY MODEL FOR INTERTIDAL MUDFLAT CHANNELS, WITH EXAMPLES FROM THE SOLWAY FIRTH, SCOTLAND,
Leeds Univ. (England). Dept. of Earth Sciences; and Leeds Univ. (England). Div. of Geology.
P. H. Bridges, and M. R. Leeder.
Sedimentology, Vol. 23, No. 4, p 533-552, August 1976. 18 fig, 2 tab, 23 ref.

Descriptors: *Europe, *Model studies, *Sediment transport, *Mud flats, Channels, Gully erosion, Meanders, Erosion, Hydrology, Estuaries, Tides, Tidal effects, Geomorphology, Channel morphology, Channel erosion.
Identifiers: *Point-bar, Cut-bank erosion, Meander-bend tightness, Sedimentary model, Solway Firth(Scotland).

Intertidal mudflat channels (gullies) in the Solway Firth, Scotland, possess width/depth ratios similar to meandering rivers. Most channels deeper than 1 m show cut-bank slides, but narrow, deep channels also have rotational slides on the point-bar slopes. The channels display two types of point-bar. The first, associated with gently curved meanders, is sigmoidal in profile. The second, associated with tight meander bends, possesses a pronounced lower platform. The onset of flow separation in meander bends, a phenomenon which enhances cut-bank erosion and point-bar deposition, is a direct function of meander-bend tightness and Froude number. The effects of flow separation are greatest on tight meander bends at times of high velocity during late spring ebb and also during rainfall run-off at low tide. These events appear to be responsible for the growth of the point-bar platforms. A model, predicting the type of point-bar development to be expected in different channel meanders, was used to reconstruct the sedimentary history of active and fossil point-bars. (Lee-ISWS)
W77-01629

GRAVITATIONAL CIRCULATION IN LONG ISLAND SOUND,
State Univ. of New York at Stony Brook, Marine Sciences Research Center.
R. E. Wilson.
Estuarine and Coastal Marine Science, Vol. 4, No. 4, p 443-453, July 1976. 7 fig, 16 ref.

Descriptors: *Estuaries, *Gravitational water, Circulation, *New York, Estuarine environment, Tides, Tidal effects, Sea water, Freshwater, Salinity, Density stratification, Waste dilution, *Water circulation.
Identifiers: *Gravitational circulation, *Long Island Sound, Density gradients, Estuarine characteristics, Tidal motions, Dynamic balance, Transport.

Long Island Sound has some important estuarine characteristics including tidal motions transmitted from the sea and a dilution of seawater with freshwater. Longitudinal salinity and associated density gradients exist in the Sound throughout the year and maintain non-tidal, two-layer gravitational circulation. The volume transport due to this circulation was determined from simple dynamic computations based on a force balance between the vertical gradient of the turbulent stress resulting from tidal motions and the pressure gradient resulting from horizontal density variations. Data from four hydrographic cruises conducted in the Sound by Marine Sciences Research Center were used to evaluate the horizontal pressure gradient. The transport computations indicated that gravitational circulation was well developed in the western and central Sound and was intense in the eastern Sound. (Roberts-ISWS)
W77-01634

RESPONSE OF THE PATUXENT ESTUARY TO A WINTER STORM,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
A. J. Elliott.

Chesapeake Science, Vol. 17, No. 3, p 212-216, September 1976. 5 fig, 1 tab, 7 ref.

Descriptors: *Currents(Water), *Tides, *Chesapeake Bay, Current meters, Salinity, River flow, Water level fluctuations, Water levels, Storms, Winds, Estuaries, Mathematical studies, Maryland.
Identifiers: *Current records, *Tidal records, *Patuxent Estuary(Md), River response, Surface slopes, Current meter moorings, Salinity sections, Tidal heights.

During March 17-18, 1973, 10-20 m/s winds blew steadily from the NW across the Chesapeake Bay area. These winds were part of a larger system of storms which affected the east coast. Current and tidal records from the Patuxent estuary were analyzed to investigate the response of the river to the storm. The Patuxent is a partially mixed, coastal plain estuary which is a tributary of the Chesapeake Bay. The storm depressed mean water levels throughout the Chesapeake area and the Patuxent required two days to recover to its former mean water level. Surface slopes provided evidence for the existence of a long period seiche, approximately 88 hours. In the Patuxent, mean levels dropped by about 50 cm. (Roberts-ISWS)
W77-01635

RESPONSES OF PHYTOPLANKTON TO RENEWED SOLAR RADIATION IN A STRATIFIED INLET,
Fisheries and Marine Service, Nanaimo (British Columbia). Biological Station.
For primary bibliographic entry see Field 5C.
W77-01659

IMPACT OF WATER RESOURCE DEVELOPMENT ON COASTAL EROSION, BRAZOS RIVER, TEXAS,
Texas A and M Univ., College Station. Dept. of Geology.
C. C. Mathewson, and L. L. Minter.
Texas Water Resources Institute, College Station, Completion Report TR-77, August, 1976. 85 p, 3 tab, 28 fig, 40 ref, 2 append. OWRT B-201-TEX(1). 14-34-0001-6123.

Descriptors: *Erosion rates, Hydrograph analysis, *Texas, *Beach erosion, Deltas, Rivers, Reservoirs, *Sediment load, Dams, Water resources development, *Frequency curves, Regulation, *Sediment transport, River basins.
Identifiers: *Coastal erosion, *Brazos River delta(Tex).

Major dam and reservoir development within the Brazos River Basin is correlative with a significant decrease in the suspended sediment load of the river and with increased coastal erosion rates near the delta. A hydrologic analysis of the river discharge, by use of cumulative frequency curves, shows that discharge control by dam regulation has reduced the frequency of high discharges, thus smoothing out the river hydrograph and reducing the amount of sediment the river is able to carry and deliver to the coastal zone. In addition, the reservoirs are presently trapping about 76% of all sand produced within the basin. An analysis of bed load samples taken downstream of the dams indicated that the sand sizes necessary for beach nourishment are not being transported through the lower reaches of the river. The amount of sand denied access to the coastal zone through the loss of the river's transporting ability and reservoir entrapment has been determined, and is shown to be enough to account for the entire increase in the coastal erosion rates in the study area since at least 1937. Future sand losses brought about by the construction of new reservoirs downstream of those presently on the Brazos River, or one of its major tributaries, can be predicted by the decrease in the effective drainage basin area.
W77-01681

PROCEEDINGS OF THE NATIONAL WETLAND CLASSIFICATION AND INVENTORY WORKSHOP, 1975.
Fish and Wildlife Service, Washington, D. C. Office of Biological Services.
For primary bibliographic entry see Field 4A.
W77-01682

THE ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM. FIRST YEAR WORK PRODUCT: VOLUME I; THE LEGAL FRAMEWORK: LAKE MICHIGAN AND ITS SHORE,
For primary bibliographic entry see Field 6E.
W77-01689

THE POTENTIAL USE OF RESERVATIONS TO INTERNATIONAL AGREEMENTS PRODUCED BY THE THIRD UNITED NATIONS CONFERENCE ON THE LAW OF THE SEA,
Louisiana State Univ. Law Center, Baton Rouge.
For primary bibliographic entry see Field 6E.
W77-01705

THE THIRD UNITED NATIONS LAW OF THE SEA CONFERENCE: CARACAS,
Louisiana State Univ. Law Center, Baton Rouge.
For primary bibliographic entry see Field 6E.
W77-01706

USE OF OUTER BARS OF INLETS AS SOURCES OF BEACH NOURISHMENT MATERIAL,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
T. L. Walton, Jr., and R. G. Dean.
Shore and Beach, July 1976. 8 p, 4 fig, 1 tab, 11 ref.

Descriptors: *Barrier islands, *Shore protection, *Inlets(Waterways, Beaches, Sand bars).
Identifiers: *Beach nourishment, Outer bars, Beach fill.

Outer bars of inlets appear to contain large quantities of high quality material which can be used for beach nourishment purposes without significant adverse effects on adjacent beaches. Although the effective utilization of outer bar material will require innovative approaches to dredging technology, the split-hull work barge concept appears promising, particularly if a self-loaded capability can be added. The effect of removal of outer shoal material on adjacent beaches must be assessed for each individual situation and the relative merits of possible preferable material characteristics from these source areas weighed against increased pumping costs, etc. To properly assess the benefits to beach stability of different sized material from competing borrow areas, it will be necessary to evaluate existing methods of assessing compatibility of beach fill or develop improved procedures. (NOAA)
W77-01708

METHOD OF PROTECTING A PILE IMBEDDED IN OFFSHORE AREAS HAVING A SHIFTING LAYER OF MUD,
Union Oil Co. of California, Brea. (Assignee).
For primary bibliographic entry see Field 8D.
W77-01711

METHOD FOR MEASURING VELOCITY AND DIRECTION OF CURRENTS IN A BODY OF WATER,
Office of the Secretary (Navy), Washington, D. C. (Assignee).
For primary bibliographic entry see Field 7B.
W77-01713

SELF-REGULATING TIDE GATE,
Rockwell (W. S.) Co., Fairfield, Conn. (Assignee).
For primary bibliographic entry see Field 8C.
W77-01728

WATER GATE,
For primary bibliographic entry see Field 8C.
W77-01729

SUBTIDAL CONCRETE PILING FAUNA IN MONTEREY HARBOR, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5A.
W77-01783

EFFECTS OF SUSPENDED SOLIDS ON SELECTED ESTUARINE PLANKTON,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 5C.
W77-01784

BENTHIC NUTRIENT REGENERATION AND ITS COUPLING TO PRIMARY PRODUCTIVITY IN COASTAL WATERS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W77-01789

A NOTE ON STANDING CROPS OF SPARTINA ALTERNIFLORA IN TEXAS AND FLORIDA,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-01792

SUSPENDED SEDIMENT DETERMINATION IN ESTUARINE WATERS FROM PHOTOMETER AND SECCHI DISC MEASUREMENTS,
Naval Academy, Annapolis, Md.
For primary bibliographic entry see Field 5A.
W77-01795

THE DEMONSTRATION AND STANDARDIZATION OF A METHOD FOR MONITORING THE ECOLOGICAL EFFECTS OF MARINE WASTE DISCHARGES.
Biome Co., Inc., Surfside, Calif.
For primary bibliographic entry see Field 5A.
W77-01806

ABUNDANCE AND SEASONAL DISTRIBUTION OF MARINE MAMMALS IN THE GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01827

BIOLOGY OF THE HARBOR SEAL, PHOCA VITULINA RICHARDI, IN THE GULF OF ALASKA,
Alaska Dept. of Fish and Game, Anchorage.
For primary bibliographic entry see Field 6G.
W77-01831

DISTRIBUTION AND ABUNDANCE OF SEA OTTERS IN SOUTHWESTERN BRISTOL BAY,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-01836

POPULATION ASSESSMENT, ECOLOGY AND TROPHIC RELATIONSHIPS OF STELLER SEA LIONS IN THE GULF OF ALASKA,
Alaska Dept. of Fish and Game, Anchorage.
For primary bibliographic entry see Field 6G.
W77-01837

OUTER CONTINENTAL SHELF ASSESSMENT PROJECT. RAZOR CLAM HABITAT SURVEY - GULF OF ALASKA,
Alaska Dept. of Fish and Game, Kodiak.
For primary bibliographic entry see Field 6G.
W77-01843

A DESCRIPTION AND NUMERICAL ANALYSIS OF THE FACTORS AFFECTING THE PROCESSES OF PRODUCTION IN THE GULF OF ALASKA,
Washington Univ., Seattle.
For primary bibliographic entry see Field 6G.
W77-01844

REVIEW OF LITERATURE AND HISTORICAL DATA ON NON-SALMONID PELAGIC FISHERIES RESOURCES OF THE EASTERN BERING SEA AND GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01845

BASELINE CHARACTERIZATION, LITTORAL BIOTA, GULF OF ALASKA AND BERING SEA,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.
For primary bibliographic entry see Field 6G.
W77-01846

PLANKTON OF THE GULF OF ALASKA - ICHTHYOPLANKTON,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 6G.
W77-01847

INITIAL ZOOPLANKTON INVESTIGATIONS,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 6G.
W77-01848

PHYTOPLANKTON AND PRIMARY PRODUCTIVITY IN THE NORTHEAST GULF OF ALASKA,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 6G.
W77-01849

BASELINE STUDIES OF DEMERSAL RESOURCES OF THE NORTHERN GULF OF ALASKA SHELF AND SLOPE: AN HISTORICAL PREVIEW,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01852

BEAUFORT SEA ESTUARINE FISHERY STUDY,
Alaska Dept. of Fish and Game, Fairbanks. Sport Fish Div.
For primary bibliographic entry see Field 6G.
W77-01854

THE DISTRIBUTION, ABUNDANCE, DIVERSITY, AND PRODUCTIVITY OF BENTHIC ORGANISMS IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01855

SUMMARIZATION OF EXISTING LITERATURE AND UNPUBLISHED DATA ON THE DISTRIBUTION, ABUNDANCE AND PRODUCTIVITY OF BENTHIC ORGANISMS OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01856

FOOD AND FEEDING RELATIONSHIPS IN THE BENTHIC AND DEMERSAL FISHES OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01857

PREPARATION OF ILLUSTRATED KEYS TO SKELETAL REMAINS AND OTOLITHS OF FORAGE FISHES - BERING SEA AND GULF OF ALASKA,
Alaska Univ., College.
For primary bibliographic entry see Field 6G.
W77-01858

PREPARATION OF ILLUSTRATED KEYS TO SKELETAL REMAINS AND OTOLITHS OF FORAGE FISHES - BEAUFORT SEA,
Alaska Univ., College.
For primary bibliographic entry see Field 6G.
W77-01859

THE PHYSIOLOGICAL EFFECT OF ACUTE AND CHRONIC EXPOSURE TO HYDROCARBONS OF PETROLEUM ON THE NEAR-SHORE FISHES OF THE BERING SEA,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5C.
W77-01864

RESPONSE OF THE CLAM, MACOMA BALTHICA (LINNAEUS), ESPOSED TO PRUDHOE BAY CRUDE OIL AS UNMIXED OIL, WATER-SOLUBLE FRACTION, AND SEDIMENT-ADSORBED FRACTION IN THE LABORATORY,
National Marine Fisheries Services, Auke Bay, Alaska. Auke Bay Lab.; and National Marine Fisheries Services, Seattle, Washington. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01867

EFFECT OF PETROLEUM HYDROCARBONS ON BREATHING AND COUGHING RATES, AND HYDROCARBON UPTAKE-DEPURATION IN PINK SALMON FRY,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01868

ACUTE EFFECTS - PACIFIC HERRING ROE IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-01872

EVALUATION STRATEGIES OF METAL POLLUTION IN OCEANS,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5A.
W77-01875

ANNUAL OPERATION OF A COASTAL GROUNDWATER BASIN AT A PRESCRIBED RELIABILITY LEVEL,
Ministry of Agriculture, Jerusalem (Israel). Hydrological Service.
For primary bibliographic entry see Field 4B.
W77-01882

POLLUTION OF THE RIVER TYNE ESTUARY--THE USE OF MATHEMATICAL MODELS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-01889

THE EFFECT OF THE NON-IDEAL COMPOSITION OF SEA WATER ON SALINITY AND DENSITY,
Woods Hole Oceanographic Institution, Mass.
P. G. Brewer, and A. Bradshaw.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A022 411, Price codes: A02 in paper copy, A01 in microfiche. Technical Report WHOI-76-16, March 1976. Reprinted from Journal of Marine Research, Vol. 33, No. 2, p 157-175, 1975. 3 fig, 4 tab, 26 ref. ONR N00014-74-C-0262, NSF GX-33295.

Descriptors: *Model studies, *Sea water, *Salinity, *Density, Mathematical models, Water chemistry, Saline water, Oceans, Chemicals, Chemical properties, Conductivity, Oceanography, *Carbon dioxide, *Silica, Pacific Ocean.

The effect of the increased alkalinity, total carbon dioxide, and silica content of deep ocean waters on the conductance-salinity-density relationship was calculated. The results led to the postulation that a density correction term can be derived, represented by Delta sigma theta = 0.0537 Delta TA -0.0096 Delta Sigma C02 + 0.042 Delta Si where Delta TA, Delta Sigma C02 and Delta Si are the alkalinity, total carbon dioxide, and silica concentration differences, in m. equiv./kg, m. moles/kg and m. moles/kg respectively, between the sample in question and an 'ideal' North Atlantic surface sea water. This correction term reaches values of up to + 0.012 sigma theta in the North Pacific, equivalent to that caused by an error of 0.1 C, or 0.015 parts per thousand salinity. These corrections are not insignificant in terms of the precision of modern hydrographic data. The effect of these corrections leads to an adjustment of up to 500 m in the depth of an isopycnal surface. The accuracy of the correction term is less certain at high pressures, and we have no information on the effect of compositional changes of this kind on compressibility. The definition of salinity is not at issue here; however, in the abyssal Pacific Ocean, salinity as used to calculate density is in error by -0.012 parts per thousand and as a truly conservative tracer by +0.008 parts per thousand. (Sims-ISWS)
W77-01911

A PRELIMINARY TIDAL EXCHANGE EXPERIMENT IN MASSET INLET,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
F. G. Barber, T. S. Murty, and J. Taylor.
Manuscript Report Series No. 39, 1975. 41 p, 9 fig, 32 ref.

Descriptors: *Inlets(Waterways), *Arctic, *Model studies, *Mathematical models, Tidal streams, Tidal waters, Flow, Hydraulics, Circulation, Water circulation, Tides, Hydrodynamics, Hydrography, Precipitation(Atmospheric), Runoff, On-site data collections, Computer models, Estuaries.
Identifiers: *Tidal exchange.

Concepts of exchange processes were reviewed briefly, including a tidal exchange process believed to have been observed in a small tidal inlet

in the Arctic. The results of a numerical experiment with the latter process in a configuration similar to Masset Inlet were presented, and a proposal concerning a field experiment was developed. (Sims-ISWS)
W77-01916

VARIATIONS IN COASTAL TEMPERATURES ON THE SOUTHERN AND CENTRAL CALIFORNIA COAST,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.
E. J. List, and R. C. Y. Koh.
Journal of Geophysical Research, Vol. 81, No. 12, p 1971-1979, April 20, 1976. 11 fig, 24 ref. NSF ENG75-02985.

Descriptors: *Water temperature, *Coasts, *California, *Pacific Ocean, Measurement, Time series analysis, Data processing, Analytical techniques, Fluctuations, Analysis, Correlation analysis, Oceanography.
Identifiers: *Temperature variations, Coastal temperatures.

The results of a time series analysis of several years of coastal ocean temperature records were presented for discussion. The records were analyzed by using digital filtering, covariance, and spectral analysis. The following conditions were found to exist: The low-frequency component of the temperature signal shows a strong seasonal component in southern California There is little seasonal fluctuation between Point Conception and Pacific Grove. A period of midwinter warming is apparent in southern California. Intermediate frequency components show strong correlations in southern California with the presence of distinct and substantial temperature events occurring almost simultaneously over distances of the order of 200 km. High-frequency components have a large standard deviation in summer (0.8C) and a low standard deviation in winter (0.4C); these components are uncorrelated at stations even a few miles apart. Some coastal stations show a strong possible diurnal component; others, including the stations on offshore islands, show no such components. Morro Bay appears to have an extraordinarily large diurnal component of temperature fluctuation. No attempt was made to relate these phenomena to other oceanographic or meteorological variables. (Sims-ISWS)
W77-01917

ON THE POSSIBLE DETECTION OF TSUNAMIS BY A MONITORING OF THE IONOSPHERE,
Cooperative Inst. for Research in Environmental Science, Boulder, Colo.
W. R. Peltier, and C. O. Hines.
Journal of Geophysical Research, Vol. 81, No. 12, p 1995-2000, April 20, 1976. 3 fig, 22 ref.

Descriptors: *Tsunamis, *Monitoring, *Ocean waves, Waves(Water), Earthquakes, Warning systems, *Atmosphere, Oceans, Equations, Hazards, Oceanography.
Identifiers: *Ionosphere, Tsunami detection.

It has been suggested that the atmospheric gravity waves that are generated by a tsunami may produce an identifiable ionospheric signature that could be employed for purposes of tsunami warnings. The intrinsic difficulties to be faced by this suggestion derive from the geometrical spreading of the tsunami signature, from the possible occurrence of heights of null response, from the reflection and absorption of wave energy in the regions between the ocean surface and the ionospheric height of observation, from the time delay experienced by the tsunami signature in reaching that height, from a degradation of amplitude when the signature is detected via its effect on isopleths of electron concentration, and from the competition of 'noise' that would obscure the signature. These difficulties were assessed in this paper and were found to be of only marginal consequence to the original suggestion, which is reinforced, therefore, as a proposal for an operational system. (Sims-ISWS)
W77-01918

CALCIUM CARBONATE DISTRIBUTION IN THE SURFACE SEDIMENTS OF THE INDIAN OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
V. Kolla, A. W. H. Be, and P. E. Biscayne.
Journal of Geophysical Research, Vol. 81, No. 15, p 2605-2616, May 20, 1976. 5 fig, 2 tab, 66 ref. ONR N00014-75-04204-A04, NSF DES-75-01568-A03.

Descriptors: *Sediments, *Calcium carbonate, *Indian Ocean, Surveys, Measurement, Mapping, *Distribution patterns, *Sediment distribution, Spatial distribution, Bathymetry, Depth, Oceans, Chemicals, Carbonates, Calcium compounds, Detritus, Recent epoch, Sedimentology, Oceanography.
Identifiers: Calcium carbonate distribution, Surface sediments.

A comprehensive calcium carbonate map for the Indian Ocean surface sediments was prepared from the analysis of about 1200 samples. The results of the analysis showed: The percent carbonate distribution shows the well-known, first-order correlation with depth, and hence, reflects the physiographic peculiarities of the Indian Ocean. Thus, on topographic highs such as most of the mid-Indian ridge, Ninety East ridge, etc., the carbonate is high (greater than 75%), whereas in deep areas such as the Wharton, Central Indian, Madagascar, and Somali basins the carbonae is low (less than 10%). Dilutions by terrigenous debris are marked in the Bay of Bengal and Arabian Sea adjacent to the Indian subcontinent and in the Mozambique Basin off southeast Africa. When the regions with significant terrigenous dilutions are excluded, certain systematic latitudinal variations in the carbonate carbonate critical depth (CCrD, depth below which less than 10% CaCO3 is present) and carbonate lysocline (depth at which a significant decrease in carbonate percent occurs) superimposed on the general first-order depth changes are evident. The CCrD is deepest in the equatorial region (10 deg N-10 deg S). Southward it gradually becomes shallow and reaches 4800-4600 m in the 20 deg S-30 deg S region and 4800 m in the 30 deg S-40 deg S region. It tends to deepen (approximately 4900 m) slightly in the 40 deg S-50 deg S region. The CCrD attains the shallowest level (3900 m) in the southernmost region (50 deg S-60 deg S) studied. The carbonate lysoclinal variation is in general opposite to that of the critical depths in the ocean north of 50 deg S and is the same as the critical depth in the 50 deg S-60 deg S region. These differences reflect the patterns of oceanic productivity and the dissolution effects of Antarctic Bottom Water. Low carbonate contents along with the presence of Antarctic diatoms and siliceous clay reported at 26 deg S-29 deg S and 60 deg E-64 deg E suggest a passage in the mid-Indian ridge in that area for the Antarctic Bottom Water flowing from the Crozet Basin to the Madagascar Basin. (Sims-ISWS)
W77-01919

EDDY ENERGY IN THE OCEANS,
Hawaii Univ., Honolulu. Dept. of Oceanography.
K. Wyrtki, L. Magaard, and J. Hager.
Journal of Geophysical Research, Vol. 81, No. 15, p 2641-2646, May 20, 1976. 5 fig, 16 ref.

Descriptors: *Eddies, *Energy, *Oceans, *Atlantic Ocean, Distribution patterns, Circulation, Ocean circulation, Data processing, Velocity, Currents(Water), Water circulation, Energy transfer, Oceanography.
Identifiers: *Eddy energy.

Observations of surface drift currents made by merchant ships were used to calculate the kinetic energy of the mean flow as well as the kinetic energy of the fluctuations, which is interpreted as eddy kinetic energy. The distribution of these properties was charted for the North Atlantic Ocean based on 1 deg squares and for the world oceans based on 5 deg squares. Both distributions showed essentially the same features; namely, high values in the western boundary currents and in the equatorial current system, and low values in the subtropical gyres. The ratio between mean energy and eddy energy was high (about 1 to 2) in the strong currents and low (about 1/20 to 1/40) in the central and eastern portions of the gyres. Comparing mean and eddy energies in ocean and atmosphere, it became apparent that edddy energies in the two systems are uncorrelated. The results were consistent with the idea that eddy motion in the ocean is generated in areas of strong mean shear flow and is subsequently distributed over the whole ocean. (Sims-ISWS)
W77-01920

WAVE PATTERNS ACROSS THE NORTH ATLANTIC ON SEPTEMBER 28, 1974, FROM AIRBORNE RADAR IMAGERY,
Jet Propulsion Lab., Pasadena, Calif.
C. Elachi.
Journal of Geophysical Research, Vol. 81, No. 15, p 2655-2656, May 20, 1976. 2 fig, 1 ref. NASA NAS7-100.

Descriptors: *Remote sensing, *Ocean waves, *Aircraft, *Atlantic Ocean, Radar, Waves(Water), Aerial photography, Weather, Storms, Wavelengths, Oceans, Oceanography.

Airborne coherent radar imagery taken during a cross-Atlantic flight was used to determine the two-dimensional wave pattern of waves on a path across the North Atlantic on September 28, 1974. The radar imagery was compared to ship reports and to photographs taken during the part of the flight when no clouds were present. The wave images were related to the presence of two major storm areas in the North Atlantic just before flight time. (Sims-ISWS)
W77-01921

EVIDENCE OF SALT-WATER INTRUSION IN SOUTHEASTERN LONG ISLAND,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W77-01924

ON THE DEVELOPMENT OF A SEASONAL CHANGE SEA-ICE MODEL,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 2C.
W77-01925

THE NONTIDAL FLOW IN THE PROVIDENCE RIVER OF NARRAGANSETT BAY: A STOCHASTIC APPROACH TO ESTUARINE CIRCULATION,
Rhode Island Univ., Kingston, Graduate School of Oceanography.
R. H. Weisberg.
Journal of Physical Oceanography, Vol. 6, No. 5, p 721-734, September 1976. 16 fig, 4 tab, 24 ref.

Descriptors: *Currents(Water), *Winds, *Estuaries, *Rivers, *Rhode Island, Current meters, Measurement, On-site investigations, Circulation, Water circulation, Stochastic processes, Velocity, Fluctuations, Atmosphere, Salinity, Density, Water temperature, Model studies, Mathematical models, Oceanography.
Identifiers: *Narragansett Bay(RI), *Providence River(RI).

Atmospherically driven flow in the Providence River (a partially mixed estuary) was examined using a 51-day velocity record measured 2 m from the bottom. Velocity fluctuations at time scales between the steady-state gravitational convection and the tidal oscillations were large and almost exclusively wind induced. The mean and variance of the velocity component lying along the channel axis were 11.7 cm/s (landward) and 166.9 sq cm/sec squared. Of this axial current variance, 48% resided at subtidal frequencies as compared with 45% associated with semidiurnal tides (the remaining 7% was mostly due to higher tidal harmonics). Over the most energetic portion of the axial current spectrum (periodicities of 4-5 days), 97% of the variance was coherent with the wind velocity component lying along the direction of maximum fetch, with the current lagging the wind by about 4 h. Owing to this extremely high coherence, a linear time-invariant stochastic model reproduced the axial current from the two orthogonal wind velocity components to within an rms error of 2.3 cm/s. The wind also had a marked effect upon the density field. It was concluded that the effects of wind can permeate the entire water column of a partially mixed estuary and can be of equal (or greater) importance to the circulation as the tides or gravitational convection. (Sims-ISWS)
W77-01926

PROBABILITY DISTRIBUTION OF CONCENTRATIONS MEASURED IN THE WAKE OF A CONTINUOUS POINT SOURCE IN COASTAL CURRENTS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W77-01927

DISPERSION OF POLLUTANTS IN THE STRAIT OF CANSO,
Nova Scotia Technical Coll., Halifax. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W77-01928

AN ANALYSIS OF INSTABILITIES CAUSED BY SALINITY GRADIENTS IN GROUNDWATER,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-01931

RADAR IMAGING OF OCEAN SURFACE PATTERNS,
Jet Propulsion Lab., Pasadena, Calif.
W. E. Brown, Jr., C. Elachi, and T. W. Thompson.
Journal of Geophysical Research, Vol. 81, No. 15, p 2657-2667, May 20, 1976. 15 fig, 23 ref. NASA NAS7-100.

Descriptors: *Remote sensing, *Ocean waves, *Radar, *Aircraft, Oceans, Waves(Water), Equations, Data processing, Currents(Water), Internal waves, Coasts, Model studies, Investigations, Equipment, Oceanography, Electrical engineering.
Identifiers: *Radar imagery, Backscatter, Surface patterns, Surface slicks, Coastal waves.

Radar imagery of ocean surface patterns was presented and discussed. The imaging radar detected changes in ocean surface backscatter and yielded imagery of deepwater gravity waves, oil slicks, island shadows, internal waves, coastal waves, and other features. The results of several observations suggested that the surface irregularities behave as isotropic scatterers for a radar wavelength of 25 cm. The popular scattering models were considered in relation to this behavior. The variable incident angle and high resolution of the imaging radar allowed the study of the scattering properties of particular surface phenomena. (Sims-ISWS)
W77-01932

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, ESCAMBIA RIVER AND BAY,
Atlantis Scientific, Tallahassee, Fla.
For primary bibliographic entry see Field 5G.
W77-01961

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, GULF OF ALASKA.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01966

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, S. CALIFORNIA BIGHT.
Tetra Tech, Inc., Pasadena, California.
For primary bibliographic entry see Field 5G.
W77-01969

DIRECTORY TO U.S. GEOLOGICAL SURVEY PROGRAM ACTIVITIES IN COASTAL AREAS, 1974-76,
Geological Survey, Reston, Va.
Available from Supt. of Documents, GPO, Wash., D.C. 20402 Price $1.75. Resources and Land Investigations Program, Bulletin 1428, 1976. 154 p, 14 fig, 2 tab, 4 ref. Marcus, P. A., Editor.

Descriptors: *Coasts, *Programs, *United States, *Federal government, *Projects, Indexing, Surface waters, Groundwater, Water quality, Topographic mapping, Energy budget, Earthquake engineering, Volcanoes, Geochemistry, Mineralogy, Oceanography, Estuarine environment, Streamflow, Water analysis, Ecology, Land use, Regulation.
Identifiers: *U.S. Geological Survey coastal programs, Directory.

This report describes 16 U.S. Geological Survey program activities in coastal areas of the United States and its territories during 1974-76 and lists the products of each project in the programs. It provides access to the Earth-science and other natural-science investigations in which the Geological Survey is currently engaged and which are capable of supporting coastal zone planning activities. Responsible individuals who can provide further assistance concerning project activities are listed. The text is organized by subject, and an index is provided for direct reference of projects on a State or territorial basis. (Woodard-USGS)
W77-02011

PICHIA SPARTINAE, A DOMINANT YEAST OF THE SPARTINA SALT MARSH,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 5C.
W77-02039

OPTIMIZING SELECTION OF MARINE RETAINING WALLS,
Mueser, Rutledge, Wentwork and Johnston, New York.
For primary bibliographic entry see Field 8F.
W77-02072

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

FINAL REPORT, MSF MODULE STUDIES, OSW SAN DIEGO TEST FACILITY.
Burns and Roe Construction Corp., Paramus, N. J.
OWRT/S--76/48, May 1973. 152 p, 17 fig, 2 tab, 4 append. DOI 14-30-3014.

Descriptors: *Desalination plants, *Flash distillation, Treatment facilities, Desalination apparatus, *Performance, *Testing, *Measurement, Baseline data collections.
Identifiers: *Multi-stage flash distillation modules, *Delta prime measurement.

This topical report covers development test programs conducted between August, 1972 and January 5th, 1973. The emphasis during this six-month run was on delta prime measurement and flash enhancer testing. Baseline data were collected over a range of stage operating conditions during trend series. Similar evaluations of delta prime were then made with a Desalting Systems and Services' enhancer, the Aqua-Chem dragon's teeth enhancer, a simple plow enhancer and with a flat-bottomed stage. These tests are discussed in detail.
W77-01551

HYGIENIC ASSESSMENT OF MEMBRANE METHODS OF WATER DESALINIZATION, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 5D.
W77-01554

METHOD FOR PRODUCING MECHANICAL ENERGY FROM GEOTHERMAL BRINE,
Union Oil Co. of California, Brea. (Assignee).
For primary bibliographic entry see Field 3C.
W77-01710

LIQUID TREATING SYSTEM,
For primary bibliographic entry see Field 5F.
W77-01739

OSMOSIS PROCESS FOR PRODUCING ENERGY,
H. H. G. Jellinek.
U.S. Patent No. 3,978,344, 7 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 949, no 5, p 2134-2135, August 31, 1976.

Descriptors: *Patents, *Energy, *Sea water, *Freshwater, *Saline water-freshwater interfaces, *Boundary processes, Membranes, Semipermeable membranes, Membrane processes, *Osmosis, *Osmotic pressure, *Desalination processes.
Identifiers: Energy production.

A process for generating energy utilizes the osmotic pressure resulting when two liquids having different chemical potentials are each placed in contact with opposite sides of the same semipermeable membrane. The process is particularly applicable to the production of energy from the system sea water/fresh water. Fresh water will pass through the semipermeable membrane into the salt water resulting in a build-up of osmotic pressure which causes salt water to be ejected through the outlet orifice. The energy can be obtained in the neighborhood of locations where fresh water (rivers) flows into the sea. The fresh water is brought into contact via the semipermeable membrane with sea water. The pressure generated by the flow of fresh water into the seawater is represented by the height of solution which has risen in a pipe installed at the top of a osmotic pressure generator. The pipe can be cut at the point where it is joined to the osmotic pressure vessel allowing the saline solution to flow out of the hole. A turbine can be rotated by the ejected liquid and electrical or mechanical energy obtained. (Sinha-OEIS)
W77-01751

ELECTROCHEMISTRY,
Southampton Univ. (England). Dept. of Physical Chemistry.
For primary bibliographic entry see Field 5D.
W77-01999

3B. Water Yield Improvement

WATER YIELDS RESULTING FROM TREATMENTS ON THE WORKMAN CREEK EXPERIMENTAL WATERSHEDS IN CENTRAL ARIZONA,
Rocky Mountain Forest and Range Experiment Station, Temple, Ariz.
For primary bibliographic entry see Field 4C.
W77-01660

FINAL REPORT, HIGH PLAINS COOPERATIVE PROGRAM CLOUD SURVEY AND SEEDING RESEARCH AIRCRAFT AND ASSOCIATED DATA PROCESSING,
Colorado International Corp., Boulder.
R. T. Beaumont.
Report to Bureau of Reclamation, Denver, Colorado, Division Atmospheric Water Resources Management, September 1976, 22 p. 6-07-DR-20100.

Descriptors: *Weather modification, *Cloud seeding, *Silver iodide, Measurement, Montana, Artificial precipitation, Instrumentation, Atmosphere.
Identifiers: *Cloud measurements, Cloud modifications, Dry ice, Airborne equipment.

An instrumented aircraft capable of seeding clouds with silver iodide and dry ice was operated as part of the Hiplex Program at Miles City, Montana during June and July, 1976. Seeding systems included AgI-NH4I acetone generators, wing and fuselage mounted racks for ejectable and burn-in-place AgI pyrotechnic flares. Dry ice (CO2) in the form of small pellets was also released from the aircraft. Variable concentration and delivery methods were used to evaluate seeding materials and dispersion techniques. An on-board data system recorded cloud parameters during survey and seeding experiments. All flight observations of atmospheric data i.e. air temperature, dew point, pressure, indicated air speed, liquid water content, rate of climb were observed every 8.5 sec and recorded on computer compatible magnetic tape. Seeding locations and pertinent data concerning seeding are given. (Bureau of Reclamation)
W77-01687

STRATEGIES TO IMPROVE WATER MANAGEMENT IN MEXICAN IRRIGATION DISTRICTS: A CASE STUDY IN SONORA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 3F.
W77-01894

PROVIDING FOR PROVIDENT DOGONS,
H. Guggenheim.
The Geographical Magazine, Vol. 48, No. 2 p. 664-669, August, 1976. 1 fig.

Descriptors: *Water storage, *Social aspects, *Arid lands, *Droughts, *Africa, Storage, Adaptation, Technology, Water loss, Dependable supply, Rainfall, *Africa.
Identifiers: *Sahel, Dogon, Mali.

The Dogon tribesmen of Mali who farm the arid lands of the Sahel have evolved a complex religion and philosophy based on seasons of drought and rain. An attempt to bring technology of water storage to the Dogon and to graft it onto their culture while protecting their ancient traditions is discussed. Water storage is difficult because of porous sandstone formations. Annual rainfall varies from 300 mm. to 600 mm. and the main grain crop, millet, suffers because it depends upon regularized rainfall. Thus, water storage is important. Dogon philosophy contains a never ending struggle between the god of water and god of drought. The author discusses construction of water storage facilities for consumption and irrigation within the context of this philosophy. (Jamail-Arizona)
W77-01896

RAINFALL INTERCEPTION BY COOL-DESERT SHRUBS,
Utah State Univ., Logan. Dept. of Range Science.
N. E. West, and G. F. Gifford.
Journal of Range Management, Vol. 29, No. 2, p 171-172, March, 1976. 7 ref.

Descriptors: *Impact(Rainfall), *Rainfall-runoff relationships, *Vegetation effects, *Desert plants, *Interception, Precipitation(Atmospheric), Rain, Rainfall, Sagebrush, Shrubs, Soil surfaces, Stemflow, Canopy, Cycling nutrients, Arid lands.

Interception patterns of big sagebrush and shadscale were measured under two simulated rainfall intensities during three different seasons for improved understanding of this phenomena in hydrologic and mineral nutrient cycling processes. Plants were collected and subjected to simulated rainfall. All plants were cut off at their stem bases, placed in a holding device on a direct reading balance, and weight gains under simulated rainfall recorded at the end of 30, 60, 120, 300, 600, at 900-second intervals, and the data subjected to analysis of variance. Mean rainfall interception rate of individual plants of both species was 0.15 centimeters when averaged over all sampling dates and rainfall intensities. On the average about 4 percent of the total annual rainfall (not snowfall) would be intercepted by these plant communities. The results will be utilized in modelling of water and mineral nutrient cycles in these ecosystems. (Jamail-Arizona)
W77-01900

3C. Use Of Water Of Impaired Quality

ACTIVITY OF NITRATE REDUCTASE IN THE ABOVEGROUND PART OF CORN UNDER CONDITIONS OF SALINIZATION OF THE MEDIUM, (IN RUSSIAN),
B. A. Alina, and L. K. Klyshev.
Izv Akad Nauk Kaz Ssr Ser Biol 13(4), p 28-31, 1975.

Descriptors: *Nitrates, *Corn(Field), Nutrients, Salinity, *Salt tolerance, Sodium chloride, Sodium sulfate, Leaves.
Identifiers: *Nitrate reductase activity(Corn).

The nitrate reductase activity of 10-15 day-old corn sprouts (leaves and stem) grown in a water culture on a nutrient medium containing various N sources (NaNO3, NH4NO3, ammonium sulfate) were investigated. NaCl and Na2SO4 were added in isoosmotic concentrations. The nitrate reductase activity of corn sprouts depended on the age of the plants and N source used. NaCl and Na2SO4 in isoosmotic concentrations caused activation of nitrate reductase in the aboveground part of corn.
W77-01599

IRRIGATION OF CORN WITH EFFLUENTS FROM FERMENTATION AND YEAST-PRODUCING PLANTS (OROSHENIE KUKURUZY STOCHNYMI VODAMI GIDROLIZNO-DROZHZHEVOGO PROIZVODSTVA),
For primary bibliographic entry see Field 5D.
W77-01645

THE INFLUENCE OF TRICKLE IRRIGATION ON THE QUALITY OF IRRIGATION RETURN FLOW,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
For primary bibliographic entry see Field 5G.
W77-01680

METHOD FOR PRODUCING MECHANICAL ENERGY FROM GEOTHERMAL BRINE,
Union Oil Co. of California, Brea. (Assignee).
T. K. Sherwood.
U.S. Patent No. 3,972,193, 10 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 949, no 1, p 52, August 3, 1976.

Descriptors: *Patents, *Geothermal studies, *Thermal properties, *Temperature, Heat flow, Flash distillation, Heat exchangers, Heat transfer.

This invention comprises the steps of producing hot geothermal brine from subterranean geothermal reservoir; passing the brine successively through a series of separate flash stages, each successive stage being maintained at a lower pressure less than the vapor pressure of the brine entering that stage so that the brine is partially flashed to vapor in each stage; countercurrently flowing a working fluid successively through the series of flash stages in indirect heat exchange with the vapor produced in each flash stage so that the vapor condenses in each flash stage and the working fluid is progressively heated as it passes through the series of flash stages; and, then, utilizing the heated working fluid in a heat engine for the production of mechanical energy. The advantages are that the hot geothermal brine does not directly contact a heat exchange surface and the hot vapors are not fed to the heat engine. The working fluid can be heated to a temperature near the temperature of the geothermal brine by the use of incremental pressure reductions in each successive flash stage. (Sinha-OEIS)
W77-01710

SHALLOW GROUND-WATER SALINIZATION IN DRYLAND FARM AREAS OF MONTANA,
Montana Univ., Missoula. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-01822

AGRICULTURAL WATER POLLUTION: SOME PROBLEMS ASSOCIATED WITH ITS CONTROL,
Kansas Univ., Lawrence. Dept. of Geography.
For primary bibliographic entry see Field 5G.
W77-01898

ABSCISIC ACID LEVEL IN TOMATO LEAVES AFTER A LONG PERIOD OF WILTING,
Aarhus Univ., (Denmark). Inst. of Plant Physiology.
For primary bibliographic entry see Field 2I.
W77-01906

EVALUATION OF AGRICULTURAL ADJUSTMENT TO IRRIGATION WATER SALINITY: A CASE STUDY FOR PINAL COUNTY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
M. A. Boster.
Ph.D. Dissertation, 1976. 180 p, 8 fig, 27 tab, 50 ref. OWRT A-048-ARIZ (3).

Descriptors: *Irrigation water, *Salinity, *Water costs, *Irrigation effects, *Water management(Applied), *Water quality, Irrigation effects, *Arizona, Irrigation, Crop production, Available water, Irrigation districts, Mathematical models, Irrigation efficiency, Salts, Irrigated land, Water sources.
Identifiers: *Central Arizona project.

The Central Arizona Project will make Colorado River water available for use in Pinal County, Arizona. The imported water will contain dissolved salts which will decrease irrigated crop yield. The optimal imported water-local water mix is determined in order to evaluate the economic adjustments of Pinal County farmers to the new water source. Mathematical programming models

of representative irrigated farms in Pinal County project adjustments implied under several assumptions as to the availability, cost and salinity of irrigated water from various sources. Results indicate that: (1) Indian farmers will receive most of the economic benefits of the project; (2) groundwater conservation will be minimal unless farmers are forced to purchase large quantities of the imported water; (3) imported water will not affect cotton acreage but will significantly increase the acreage of small grains and alfalfa; (4) salinity increase will not cause large decreases in farmer's incomes; and (5) increased income to non-Indian farmers from provision of Central Arizona Project water at the currently proposed price will not be sufficient to pay the additional fixed costs for distribution systems. (Jamail-Arizona)
W77-01909

RESPONSE OF COTTON TO NITROGEN AND WATER IN A TROPICAL ENVIRONMENT. III. FIBRE QUALITY,
Commonwealth Scientific and Industrial Research Organization, Kununurra (Australia). Div. of Land Research.
For primary bibliographic entry see Field 3F.
W77-01910

ARKANSAS RIVER WATER QUALITY RELATED TO THE IRRIGATION POTENTIAL OF ASSOCIATED SOILS,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-02065

3D. Conservation In Domestic and Municipal Use

CHARACTERIZATION OF URBAN RUNOFF - NEW JERSEY,
Rutgers - The State Univ., New Brunswick N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W77-01945

SOME CONSEQUENCES OF AREA WIDE RUNOFF CONTROL STRATEGIES IN URBAN WATERSHEDS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4D.
W77-01947

WATER POLLUTION CONTROL LAW OF 1972, REGIONAL IMPACTS, KANAWHA RIVER.
Dames and Moore, Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W77-01975

3E. Conservation In Industry

HYGIENIC EVALUATION OF THE STATE OF PROTECTION OF A WATER BODY FROM POLLUTION IN THE REGION OF AN INDUSTRIAL COMPLEX, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 5D.
W77-01555

HYGIENIC CHARACTERISTICS OF WASTEWATER TREATMENT PROCESSES OF FLAX-PROCESSING PLANTS, (IN RUSSIAN),
For primary bibliographic entry see Field 5D.
W77-01556

THE WASTE TREATMENT FACILITY OF MONADNOCK PAPER MILLS, INC.
For primary bibliographic entry see Field 5D.
W77-01641

INTRODUCTION OF A NEW EFFLUENT PURIFICATION SYSTEM (VNEDRENIE NOVOI SKHEMY OCHISTKI STOKOV),
Penzenskaya Bumazhnaya Fabrika 'Mayak Revolutsii' (USSR).
For primary bibliographic entry see Field 5D.
W77-01644

MODERN METHODS OF PURIFYING PULP AND PAPER MILL EFFLUENTS (SOVREMENNYE METODY OCHISTKI STOCHNYKH VOD PREDPRIATII TSELLYULOZNO-BUMAZHNOI PROMYSHLENNOSTI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Leningrad (USSR); and Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidroliznoi Promyshlennosti, Moscow (USSR).
For primary bibliographic entry see Field 5D.
W77-01657

WATER IN GENERAL AND ITS INDUSTRIAL USE IN PARTICULAR (ALLGEMEINES UEBER DAS WASSER UND BESONDERES UEBER SEINEN INDUSTRIELLEN GEBRAUCH),
W. Brecht.
Zellstoff und Papier, Vol. 25, No. 8, p 240-246, August, 1976. 4 fig, 26 ref, 3 tab.

Descriptors: *Water supply, *Water demand, *Industrial water, Hydrologic cycle, United States, Africa, Water purification, Waste water treatment, Pulp and paper industry, Water reuse, Water conservation.
Identifiers: USSR, Closed systems.

The available water of the world is estimated, and its cycle in nature is discussed. In connection with supply and demand, some large projects planned in America, the Soviet Union, and Africa are pointed out. The industrial use of water usually requires preliminary purification as well as effluent purification. Means for reducing the requirements of fresh water for pulp and paper mills are discussed, especially closed systems for water circulation. (Ward-IPC)
W77-01661

BLEACH MODIFICATIONS TO REDUCE POLLUTANTS,
Weyerhaeuser Co., Everett, Wash.
For primary bibliographic entry see Field 5D.
W77-01663

USE OF CHLORINE DIOXIDE-ALKALI FOR HIGH-YIELD PULPING,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 5D.
W77-01664

AN OVERVIEW OF NEW PULP BLEACHING DEVELOPMENTS,
Hooker Chemicals and Plastics Corp., Niagara Falls, N. Y.
For primary bibliographic entry see Field 5D.
W77-01665

DISPOSAL OF FLEXO INK WASHUP WASTE WATER,
For primary bibliographic entry see Field 5D.
W77-01670

WHITEWATER SYSTEM CLOSURE IN NSSC CORRUGATING MEDIUM MANFACTURE,
Green Bay Packaging Inc., Wis.
For primary bibliographic entry see Field 5D.
W77-01673

AN INVESTIGATION OF THE SEPARABILITY AND REUSE POTENTIAL OF THE ASH COMPONENT OF HIGH-ASH CONTENT PAPER MILL SLUDGES,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W77-01679

MAGNETIZATION OF IRON CHROMIUM SYSTEM,
Ford Motor Co., Dearborn, Mich. (Assignee).
For primary bibliographic entry see Field 5D.
W77-01709

TREATMENT OF CONDENSATES,
Societe d'Assistance Technique pour Porduits Nestle S.A., Lausanne (Switzerland). (Assignee).
For primary bibliographic entry see Field 5D.
W77-01716

REMOVAL OF CHROMIUM, CHROMATE, MOLYBDATE AND ZINC,
Chemical Separations Corp., Oak Ridge, Tenn. (Assignee).
For primary bibliographic entry see Field 5G.
W77-01717

FILTER, ESPECIALLY FOR BACK WATER,
Myrens Verksted A/S, Oslo (Norway). (Assignee).
For primary bibliographic entry see Field 5D.
W77-01720

WATER RECYCLE TREATMENT SYSTEM FOR USE IN METAL PROCESSING,
Data General Corp., Southboro, Mass. (Assignee).
For primary bibliographic entry see Field 5D.
W77-01724

APPARATUS FOR REMOVING PARTICLES AND CHEMICALS FROM A FLUID SOLUTION,
For primary bibliographic entry see Field 5D.
W77-01737

PROCESS FOR RECOVERING USABLE OLIVE-PROCESSING LIQUOR FROM OLIVE-PROCESSING WASTE SOLUTION,
Department of Agriculture, Washington, D. C. Office of the Secretary.
For primary bibliographic entry see Field 5D.
W77-01741

FOOD PROCESSING RESIDUALS MANAGEMENT A SYSTEMS APPROACH,
Washington Univ., Seattle. Dept. of Civil Engineering.
M. Swayne, and B. Mar.
Completion Report, July 1976. 66 p. 5 fig, 15 tab, 35 ref, append. OWRT A-081-WASH(1), 14-34-0001-6050.

Descriptors: Management, Costs, Optimization, Model studies, *Systems analysis, Foods, *Food processing industry, Regional analysis.
Identifiers: *Residuals management(Food), Cost effectiveness, *Fruit and vegetable industry.

A year long study to develop information and apply systems engineering approaches to residuals management in the fruit and vegetable processing industry is reported. The study outputs include: (1) Basic information on residuals generation, control, disposal and costs developed from a data base including information on 738 plants and 1920 processing operations, covering 82 different types; (2) A methodology for developing flexible modular cost-effectiveness simulation models, including

typical costs for 24 residual management methods including insplant, end-of-pipe and disposal, (3) the development and testing of both linear and dynamic programming techniques to optimize plant level residual management, and (4) the identification of concepts and methods to extend the data and methods developed in this study for use in regional analyses of residual management.
W77-01813

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, GRAIN MILLING.
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W77-01954

STRATEGIC ENVIRONMENTAL ASSESSMENT SYSTEM, RESIDUALS FORECASTING, AN ANALYSIS OF RESULTS,
International Research and Technology Corp., Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-01958

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PILOT STUDY, FIVE INDUSTRIES,
Conference Board, Inc., New York.
For primary bibliographic entry see Field 5G.
W77-01959

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, CHEMICAL AND ALLIED INDUSTRIES,
International Research and Technology Corp., Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-01960

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, STEAM ELECTRIC POWER INDUSTRY, (VOLUME 1, 2 AND 3).
Taknekron, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 5G.
W77-01983

THE METSEP PROCESS FOR THE SEPARATION AND RECOVERY OF ZINC, IRON, AND HYDROCHLORIC ACID FROM SPENT PICKLE LIQUORS,
National Inst. for Metallurgy, Johannesburg (South Africa).
For primary bibliographic entry see Field 5D.
W77-01987

KODAK DISPOSES OF WASTE IN SYSTEM THAT HELPS PAY ITS WAY,
For primary bibliographic entry see Field 5D.
W77-01989

PHYSICAL-CHEMICAL METHODS FOR THE RECOVERY OF PROTEIN FROM WASTE EFFLUENT OF POTATO CHIP PROCESSING,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 5D.
W77-01991

NEW DEVELOPMENTS IN UTILIZATION OF WASTES FROM FOOD INDUSTRY PLANTS.
For primary bibliographic entry see Field 5D.
W77-01992

DISTILLERY WASTES AS FERTILIZER.
For primary bibliographic entry see Field 5D.
W77-01993

REMOVAL OF POTASSIUM FROM SUGAR INDUSTRY BY-PRODUCTS.
For primary bibliographic entry see Field 5D.
W77-01995

REMOVAL OF HEAVY METALS FROM INDUSTRIAL EFFLUENTS,
National Enforcement Investigations Center, Denver, Colo.
For primary bibliographic entry see Field 5D.
W77-01997

FOAMY COMPLEX FORMATION FOR REMOVING AND RECOVERING OF HEAVY METAL IONS IN DILUTE SOLUTIONS WITH N-MONODECANOYL DIETHYLENETRIAMINE,
Government Industrial Research Inst., Nagoya (Japan).
For primary bibliographic entry see Field 5D.
W77-01998

CONTINUOUS TREATMENT OF WOOL WASH LIQUID - EFFICIENCY INCREASED BY SUPPLEMENTARY CLOSED CONTAMINANT TREATMENT CIRCUIT LINKED TO LIQUID CLEANING CIRCUIT.
For primary bibliographic entry see Field 5D.
W77-02002

LAUNDERING AND DRY-CLEANING,
For primary bibliographic entry see Field 5D.
W77-02005

INDUSTRIALIST VIEW,
Chamber of Commerce of the United States, Washington, D. C.
For primary bibliographic entry see Field 6G.
W77-02050

PANEL 'D' - POWER PLANT AND INDUSTRIAL EMISSIONS AND EFFLUENTS,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 6G.
W77-02055

PANEL 'E' - RESOURCE EXTRACTION,
Geological Survey, Reston, Va. National Center.
For primary bibliographic entry see Field 6G.
W77-02056

3F. Conservation In Agriculture

CHANGE IN THE PROPORTION OF ORGANOPHOSPHORUS COMPOUNDS IN COTTON VARIETY 'TASHKENT-2' UNDER THE EFFECT OF A MOISTURE DEFICIT, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Inst. of Experimental Plant Biology.
KH. S. Samiev, and K. G. Marfina.
S-Kh Biol 10(4), p 620-622, 1975.

Descriptors: *Organophosphorus pesticides, *Cotton, Droughts, Soils, *Moisture deficit, Soil moisture, Crop production.

In cotton cultivar 'Tashkent-2' in the presence of severe soil drought (46% of maximum field capacity), the water content of the leaves decreased and the water-retaining capacity of the tissues increased, which led to a decrease of the P content of the acid-soluble fraction and of nucleic acids (DNA, RNA). After a moderate drought to 57% of capacity) and watering of the plants P was absorbed more intensely, which ultimately weakened the unfavorable effect of a moisture deficit on the physiological activity of the plants. In plants that underwent severe and prolonged drought before watering the metabolism of organophosphorus compounds was activated after watering to a considerably lesser degree. With a soil moisture content of 71% of the maximum field capacity the yield was 44.5 centners/ha and at 46% the yield dropped to 24.4 centners/ha.--Copyright 1976, Biological Abstracts, Inc.
W77-01603

AN AID TO AGRICULTURAL DEW FORECASTING,
National Weather Service, Fort Worth, Tex. Southern Region.
For primary bibliographic entry see Field 2B.
W77-01704

WATERING APPARATUS HAVING AUTOMATIC FEED,
M. Laureau.
U. S. Patent No. 3,972,477, 10 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 146, August 3, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Water distribution(Applied), Application equipment, Hydraulic equipment, Remote control.
Identifiers: Standpipes.

A single standpipe is carried on a sled or carriage which is capable of following the path of the fixed waterpipe with hydrants. The standpipe is vertically and axially moveable and is coupled to the watering vehicle by means of a flexible conduit of great length which is wound on a reel having an axial outlet. The return displacement of the standpipe and the sled on which it is supported is assured during periods of stoppage of the watering through the action of the winding of the reel. The continuity in time of the feed under hydraulic pressure for activating the jack for opening the valve and that of releasing the automatic locking means with the hydrant is assured by means of a hydropneumatic accumulator carried by the watering vehicle. An engine provides the drive force necessary to activate the reel during the periods of traction of the sled towards the stopped watering vehicle. A single, fexible small conduit is placed in the interior of the aforesaid flexible conduit and permits by means of a hydraulic assembly to insure the remote control of the disengagement jack of the standpipe from the watering vehicle at the time of encounter with a subsequent hydrant and the remote control from the sled of the stoppage of the engine on the vehicle when the standpipe is engaged on a new hydrant. (Sinha-OEIS)
W77-01714

HYDRAULIC ACTUATED LOAD SENSING GOVERNOR,
Heinzman Engineering Inc., Grand Island, Nebr. (Assignee).
J. C. Groelz.
U. S. Patent No. 3,972,478, 6 p, 7 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 146, August 3, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Flow control, Water distribution(Applied), Application equipment.

The object of this invention is to provide a hydraulically actuated governor for an inward radial type turbine for a sprinkler vehicle which continually adjusts to fluctuations in load causing only the required amount of water to pass through the turbine and allowing the remainder to bypass the turbine. The amount of water going through the turbine will increase as the load increases. Any abnormally high pressure drops across the hydraulic turbine at the beginning of the sprinkler run when the load is light are eliminated. A simple spring tension adjustment for the sprinkler maching permits the machine to operate over a wide gallonage

range of 150 to 1,000 gallons per minute. This makes it possible for the operator to change the sprinkler nozzle size, without the need to change the turbine size. (Sinha-OEIS)
W77-01715

QUICK-CONNECT FITTINGS FOR A TRICKLE TYPE IRRIGATION SYSTEM,
R. E. Diggs.
U.S. Patent No. 3,973,732, 6 p, 9 fig, 17 ref; Official Gazette of the United States Patent Office, Vol 949, No 2, p 590, August 10, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Water distribution(Applied), Application equipment, Pipes.
Identifiers: Trickle irrigation, Pipe fittings.

This invention provides fittings for a trickle type irrigation system where plastic pipes and the like may be quickly and easily joined together in a secure and leakproof manner without the use of tools, thus resulting in a substantial savings in labor and cost. One form of fitting has a piercing means on one end for penetrating the side of a plastic pipe to make a secure and leakproof connection. The other end is tapered and has an externally serrated surface for quick connection to a plastic pipe. Or a resilient compressible orifice member is clamped between two body members and the body members have concave, tapered adjacent surfaces for engaging the orifice member to press it radially inward to restrict the size of the orifice. (Sinha-OEIS)
W77-01723

SELF-CORRECTING LINEARLY MOVABLE IRRIGATION SYSTEM,
Gifford-Hill and Co., Inc., Lubbock, Tex. (Assignee).
H. Indresaeter.
U.S. Patent No. 3,974,845, 22 p, 14 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 972, August 17, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation systems, *Irrigation efficiency, Water distribution(Applied), Application equipment, Conveyance structures, Controls.

A linearly movable irrigation system includes interconnected power driven irrigation sections supporting a water supply conduit. The sections are capable of moving over a land area and depositing a controlled amount of water. At one extremity of the irrigation system a mobile power and control unit is provided that accepts water from a water supply system and conducts it to the overhead irrigation pipe under sufficient pressure to cause proper distribution of water through sprinkler devices located along the length of irrigation conduit. A power driven pump supported by the power and control unit provides boosting pressure for the water. The power and control unit is adapted to move in proximity to an elongated reference (guide) which may be straight or curved as desired. The power and control unit can sense linear displacement and angular relationship and can induce control signals to the irrigation system to maintain alignment of the system within an acceptable range. Each extremity of the system may remain static while the other moves or while interior sections move. The extremities may also move simultaneously at equal speeds or at different speeds to accomplish controlled movement during irrigation operations. (Sinha-OEIS)
W77-01730

DRIP IRRIGATION VALVE WITH SPRING BIASED PLUNGER,
C. Bentley.
U.S. Patent No. 3,974,853, 6 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 975-976, August 17, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, *Flow control, Water distribution(Applied), Application equipment, Valves.
Identifiers: *Drip irrigation.

The invention provides a valve in which pressure compensation is provided without having to control the characteristics of a seal or other rubber element. A drip irrigation valve comprises an outer member having a passage, an inner member receivable in the passage, a groove in one of the members, and a seal carried by the other of the members. Water can be admitted through an inlet to the passage on one side of the seal to provide a fluid force on the inner member. The seal cooperates with the groove to define a restricted flow path. A spring urges the inner member in a direction to oppose the fluid force on the inner member. The groove is tapered or otherwise has regions of different cross sectional areas so that the flow rate through the restricted flow path can be established by the relative axial positions of the inner and outer members. (Sinha-OEIS)
W77-01731

SOIL MOISTURE AND IRRIGATION STUDIES, II. PROCEEDINGS OF A PANEL.
For primary bibliographic entry see Field 2G.
W77-01735

EFFECT OF SOIL CULTIVATION, FERTILIZERS AND PRECEDING CROPS ON THE ACCUMULATION, RETENTION AND CONSUMPTION OF MOISTURE BY SOIL AND WINTER WHEAT PLANTS, (IN RUSSIAN),
I. E. Bukhar, and T. N. Medvedeva.
Izv Akad Nauk Mold SSR Ser Biol Khim Nauk 2, p 85-89. 1975.

Descriptors: *Cultivation, *Fertilizers, *Soil moisture, *Wheat, Moisture content, Crop production, Nutrients.
Identifiers: Winter wheat, Mineral fertilizer, Organic fertilizer.

The accumulation and retention of x moisture in soil, especially under tilled crops, are promoted by periodic deep plowing to 35-38 cm and optimal time of fall plowing. Organic and mineral fertilizers have a favorable effect on water use by wheat plants. New high productivity winter wheat varieties use water more efficiently for the formation of a unit yield.--Copyright 1976, Biological Abstracts, Inc.
W77-01736

OSCILLATING SPRINKLER,
James R. Coson, Fresno, Calif. (Assignee).
J. A. Royer.
U.S. Patent No. 3,977,610, 6 p, 5 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 949, No 5, p1913, August 31, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Water distribution(Applied), Application equipment.
Identifiers: *Oscillating sprinklers.

An oscillating sprinkler having improved provision for confining its discharge to a predetermined arc through which the sprinkler reciprocates, includes a nozzle adapted to direct a stream along an axis in predetermined relation, a pair of cooperative concave vanes, and means for mounting the vanes in fixed spaced relation for integral movement to and from the stream with their concavities placed toward a predetermined fluid path. One of the vanes is adjacent to the nozzle and has an inner end placed in acute angular relation to the axis when in the stream and an opposite end curved laterally from the axis. The other vane is spaced laterally and longitudinally of the axis for the other vane in the direction of curvature and has an inner end substantially parallel to the opposite end of the first vane. Its opposite end is parallel to the inner end of the first vane. (Sinha-OEIS)
W77-01745

PERIPHERAL WATER BALANCE CONTROL FOR CENTER PIVOT IRRIGATION SYSTEM,
Valmont Industries, Inc., Valley, Nebr. (Assignee).
D. A. Christensen, C. R. Ostrom, and R. L. Frankenstein.
U.S. Patent No. 3,979,062, 14 p, 10 fig, 2 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 950, no 1, p 191, September 7, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, *Control systems, Conveyance structures, Distribution systems, Water distribution(Applied), Application equipment.
Identifiers: Sensors.

A water balance control for a pivotal end boom connected to the outer end of a center pivot irrigation system to irrigate peripheral areas (e.g., corners) beyond the periphery of the circular area covered by the main conduit of the system is described. The water balance control comprises a sensing mechanism for sensing both the angular position of the boom and its direction of movement (Swing-out or swing-in) relative to the end of the main conduit. Primary control circuits, actuated by the sensing mechanism, turn the boom nozzles on and off, depending on the angular position of the boom. Secondary control circuits, also actuated by the sensing mechanism operate the primary controls in accordance with two different programs, one for swing-out movement and the other for swing-in movement. A speed control for the main conduit, also actuated by the sensing mechanism, is included. (Sinha-OEIS)
W77-01754

GOVERNOR FOR ROTARY SPRINKLER,
Rain Bird Sprinkler Mfg. Corp., Glendora, Calif. (Assignee).
B. Fortner.
U.S. Patent No. 3,979,066, 7 p, 9 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 950, No 1, p 192, September 7, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Control, Flow control, Water distribution(Applied), Application equipment, *Governors.
Identifiers: *Rotary sprinklers.

A governor device for rotary sprinklers is provided which is reliable and effective in controlling and reducing the rotational speed of the sprinkler in order to increase the useful life of the sprinkler and increase the size of the area irrigated by the sprinkler. The governor is relatively simple in structure and has no moving parts. The governor includes a reaction vane which is normally placed out of the path of the stream ejected by the sprinkler when the sprinkler is not rotating, but which will be hit by the stream when the sprinkler rotates above a desired speed. When the stream hits the vane a reverse torque is produced which slows the rate of sprinkler rotation within relatively wide ranges. By selecting the lateral location of the vane relative to the stream path, the speed of rotation can be controlled. (Sinha-OEIS)
W77-01755

DRIP OR TRICKLE EMITTER FOR USE IN DRIP OR TRICKLE IRRIGATION,
M. Lemelshtrich.
U.S. Patent No. 3,979,070, 5 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 950, no 1, p 194, September 7, 1976.

Descriptors: *Patents, Irrigation, *Irrigation practices, *Irrigation efficiency, Water distribution(Applied), Flow control, Application equipment.
Identifiers: *Drip irrigation, *Trickle emitters(Irrigation).

A drip or trickle emitter is provided for an irrigation device. The flow restrictor is composed of a disc which has two parts which fit into or onto one another in intimate contact. The interior of the device provides a meandering path for the flow and has inlets leading into the path and outlets at the end of the path. A specific feature of the invention is the manner in which the two parts, which are press fittedly connected with one another, are maintained in the connected position due to a special arrangement and due to the shape of the connected parts at the contacting regions, urging one part into intimate contact with the other in axial direction. (Sinha-OEIS)
W77-01756

40 GPM. IT WORKS IF YOU HAVE ENOUGH WELLS,
For primary bibliographic entry see Field 4B.
W77-01762

NEARLY 50,000 NEBRASKA WELLS CAUSING SOME CONCERN.
For primary bibliographic entry see Field 4B.
W77-01765

DIFFUSE AGRICULTURAL POLLUTION: THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS,
Wisconsin Univ. - Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W77-01810

SIMULATING FARM IRRIGATION SYSTEM ENERGY REQUIREMENTS,
Oregon State Univ., Corvallis. Water Resources Research Inst.
R. B. Wensink, J. W. Wolfe, and M. A Kizer.
Oregon Water Resources Research Institute, Corvallis, Completion Report WRRI-44, August 1976. 105 p, 28 fig, 3 tab, 23 ref, 2 append. OWRT A-033-ORE (1).

Descriptors: Irrigation *Energy, *Farm management, *Irrigation systems, Performance, Operations, Consumptive use, Agriculture, *Sprinkler irrigation, *Irrigation practices.
Identifiers: *Trickle irrigation, *Gravity irrigation systems.

The development of the energy crisis has resulted in close monitoring of depletable energy resources in the United States. Within the agricultural sector, irrigation is a large consumer of energy, with the potential of using several times more energy than all other agricultural field operations. A better understanding of how energy is used by different irrigation systems could facilitate more efficient use of energy by one of the largest energy consumers in agriculture. This study attempts to evaluate the total amount of non-renewable energy resources consumed in the irrigation process. Five portable and permanent sprinkler system types, plus trickle and gravity irrigation systems, were studied. An evaluation of the energy required to manufacture, install, operate, and transport the equipment for an entire irrigation season was included in the analysis. This evaluation was conducted in a variety of operating situations, with varying acreages, consumptive use rates, and total irrigation requirements.
W77-01816

ALTERNATIVES IN AREA MANAGEMENT OF GROUNDWATER,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4B.
W77-01819

WATER SUPPLY AND AMINO ACID COMPOSITION OF SUNFLOWER PROTEINS, (IN RUSSIAN),
N. S. Osik.
Dokl Vses (Ordena Lenina) Akad S-Kh Nauk Im V I Lenina 3, p 25-27. 1975.

Descriptors: Water supply, *Amino acids, Crops, Cultivation, Irrigation, *Proteins, *Crop production, *Moisture deficit.
Identifiers: *USSR(Steppe zone), *Sunflower crops.

The sunflower is cultivated mainly in the steppe zone (USSR), where the main factor limiting productivity is the lack of moisture. An improvement of the water supply of sunflowers enhances the productivity and oil content of the seeds, the constituent proteins in total protein and the amino acid composition.--Copyright 1976, Biological Abstracts, Inc.
W77-01878

SOME MOLECULAR MECHANISMS RETAINING WATER IN PLANT CELLS, (IN RUSSIAN),
Kazan Inst. of Biology (USSR).
For primary bibliographic entry see Field 2I.
W77-01881

CHANGES IN NITROGEN CONTENT IN PERENTIAL FORAGE GRASSES IN DIFFERENT GRASS MIXTURES, (IN AZERBAIJANI),
T. A. Mamedov.
Izv Akad Nauk Az SSR Ser Biol Nauk. 1, p 51-55, 1974.

Descriptors: *Proteins, *Nitrogen compounds, *Alfalfa, *Barley, *Legumes, *Irrigation, Grasses, Forages, Cereal crops, Forage grasses.
Identifiers: Apsheron Peninsula, Azerbaidzhan SSR, USSR.

The change in the content of various fractions of N compounds in forage alfalfa and bulbous barley in pure and mixed grass stands was studied on the Apsheron Peninsula of the Azerbaidzhan SSR (USSR). Perennial forage grasses in a mixed stand (1:2) in comparison with pure sowings were distinguished by a greater content of total and protein N. In grass mixtures of legumes and cereals and in pure sowings of legumes, the legume component had a greater content of protein N. Irrigation favored accumulation of N compounds in forage grasses in a pure sowing and in legume and cereal mixtures.--Copyright 1975, Biological Abstracts, Inc.
W77-01886

THE HYDROLOGY OF PREHISTORIC FARMING SYSTEMS IN A CENTRAL ARIZONA ECOTONE,
Southern Illinois Univ., Carbondale.
G. J. Gumerman, J. A. Hanson, D. Brew, K. Tomoff, and C. S. Weed.
Final Report to NASA, Lyndon B. Johnson Space Center, Houston, Tex., 1975. 270 p. 51 fig, 10 tab, 27 ref, 2 append. NAS 9-14610.

Descriptors: *Paleohydrology, *Adaptation, *Remote sensing, *Archaeology, *Southwest U.S., *Farms, Satellites(Artificial), Terrain analysis, *History, Hydrology, *Arizona, Dating, Biology, Geology, Semiarid climates, Land use, Water resources, Water management(Applied), Available water, Watersheds(Basins), Environment, Mapping, Arid lands(Southwest US).
Identifiers: *Prehistoric farming systems ecotone.

Hydrologists, geologists, biologists and archaeologists were involved in an interdisciplinary study of man's adaptation to a selected portion of the semiarid Southwest. Remote sensing data was utilized. The goals of the project were to define the environmental settings of the test area, and in doing so define the adaptations made by both prehistoric and historic populations of the test area. The principle question asked by the Central Arizona Ecotone project was how did prehistoric man adapt to the semiarid desert in south-central Arizona and to what extent did his creation of land management and water control system manipulate that environment. The findings from each discipline are presented separately and overall conclusions discussed in detail. (Jamail-Arizona)
W77-01891

FLOW RESISTANCE AND INTAKE CHARACTERISTICS OF IRRIGATION FURROWS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
M. K. Ramsey.
Master of Science Thesis, 1976. 13 fig, 58 tab, 25 ref, 7 append.

Descriptors: *Flow resistance, *Irrigation efficiency, *Irrigation effects, *Furrow irrigation, *Furrows, Irrigation, Discharge(Water), Infiltration, Water delivery, Furrows, Mathematical models, Irrigation water, Intakes, Water management(Applied).

Seven irrigations were conducted on a precision field furrow. During five, discharge was reduced. Inflow, outflow, water surface elevations, soil surface elevations, and furrow geometry were measured. Data are also presented for advance and recession times, water surface slopes, flow depths, average flow velocities, and flow retardance coefficients. Retardance coefficients were calculated from steady, uniform flow equations. Methods for the determination of an infiltration function are also presented. Results indicate a linear relationship between intake rates and wetted perimeter, and that resistance to flow increases in effect as flow depth is decreased. Also, infiltration functions developed with advance data are not accurate during the continuing phase, and infiltration functions developed from ponded furrow tests underestimate infiltration when irrigation is conducted within the same furrow. There is little difference between infiltration depths predicted with either Kostiakov or the Philip equations during the advance and continuing phases. (Jamail-Arizona)
W77-01893

STRATEGIES TO IMPROVE WATER MANAGEMENT IN MEXICAN IRRIGATION DISTRICTS: A CASE STUDY IN SONORA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
E. Palacios-Velez.
Ph.D. Dissertation, 1976. 19 fig, 20 tab, 40 ref, 3 append.

Descriptors: *Water management(Applied), *Irrigation efficiency, *Irrigation districts, *Linear programming, *Mexico, Water demand, Governments, Mathematical models, Rivers, Dams, Water quality, Crop production, Soil moisture, Water utilization, Saline water, *Arid lands.
Identifiers: *Sonora(Mex).

A study was conducted to analyze the operation of an existing irrigation district in order to (1) search for methodologies to evaluate the efficiency of water use and classify the problems related to water issues according to their relative importance; (2) find economic criteria to optimize the use of scarce natural resources, mainly water and soil; and (3) search for practical operating rules which lead to improving the efficiency of water use. Complex mathematical relationships have been simplified to meet the purpose of providing

information that can be understood by non-technical decisionimakers. These models are tested against empirical observations made in Sonora, Mexico. The results are presented and recommendations made for improving irrigation water use. (Jamail-Arizona)
W77-01894

PROVIDING FOR PROVIDENT DOGONS,
For primary bibliographic entry see Field 3B.
W77-01896

EFFECT OF SOIL MOISTURE ON NODULATION OF COWPEA AND HYACINTH BEAN,
Khartoum Univ., (Sudan). Faculty of Agriculture.
For primary bibliographic entry see Field 2I.
W77-01902

COLORADO RIVER BASIN DEVELOPMENT AND ITS POTENTIAL IMPACT ON TRIBAL LIFE,
Colorado Univ., Boulder. Dept. of Anthropology.
For primary bibliographic entry see Field 6B.
W77-01903

APPLIED CLIMATOLOGY AND FOOD PRODUCTION: THE CASE OF GRAPEFRUIT QUALITY IN THE RIO GRANDE VALLEY OF TEXAS,
Texas A and I Univ., Kingville.
J. Norwine, and J. Fucik.
Association of American Geographers, Proceedings, Vol. 7, p 169-174, 1975. 4 tab, 9 ref.

Descriptors: *Grapefruit, *Citrus fruits, *Climatic data, *Agroclimatology, *Crop production, Meteorology, Subhumid climates, *Texas, Climates, Precipitation(Atmospheric), Climatology, Evaporation, Irrigation, Moisture availability, *Evaportranspiration, Solar radiation, Temperature, Rio Grande River.
Identifiers: Rio Grande Valley(Tex).

A study was conducted in the semiarid Rio Grande Valley of Texas to increase knowledge of climatic influences upon citrus fruit. Climatological variables were monitored over a ten year period and correlated with weekly measurements of ruby red grapefruit diameters. Previous studies of climatic influences upon citrus fruits have suggested that grapefruit size harvest is positively correlated with precipitation in the spring and summer and with temperature in spring and negatively correlated with high temperatures. In this study not one moisture term (precipitation, actual evaportranspiration, and potential evaportranspiration) was related significantly to grapefruit diameter in any month. This was due to the frequent application of irrigation water during the growing season. Because of extremely high evaporation rates and limited precipitation during the summer in the Rio Grande Valley, nearly all commercial crops are irrigated. Without such water it is likely that moisture availability would be a critical factor. Conclusions are that: (1) warm days and nights in April and several earlier months are conducive to large fruits six months later; (2) temperatures and solar radiation levels in August and September are excessive for most efficient fruit growth, and (3) regression equations based upon climate alone may be used with confidence to predict fruit quality at harvest. (Jamail-Arizona)
W77-01905

USE OF CONSTANT LEVEL JAIN EVAPORIMETER IN SCHEDULING IRRIGATION,
Udaipur Univ. (India). Dept. of Agronomy.
For primary bibliographic entry see Field 2D.
W77-01907

A TRAGEDY OF THE COMMONS IN THE SAHEL,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 6G.
W77-01908

EVALUATION OF AGRICULTURAL ADJUSTMENT TO IRRIGATION WATER SALINITY: A CASE STUDY FOR PINAL COUNTY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 3C.
W77-01909

RESPONSE OF COTTON TO NITROGEN AND WATER IN A TROPICAL ENVIRONMENT. III. FIBRE QUALITY,
Commonwealth Scientific and Industrial Research Organization, Kununurra (Australia). Div. of Land Research.
A. B. Hearn.
Journal of Agricultural Science, Vol. 86, No. 2, p 257-269, April, 1976. 7 fig, 9 tab, 15 ref.

Descriptors: *Cotton, *Fibers(Plant), *Fiber crops, *Irrigation practices, Agriculture, Fertilizers, Crop production, Irrigation efficiency, Nitrogen compounds, Irrigation, Irrigation, Irrigation water, Tropical regions.

Experiments were conducted to determine the effects of irrigation and fertilizer application on the fiber quality of cotton. In two experiments three dates for time of last irrigation were combined factorially with four rates of application of nitrogen fertilizer and two varieties of cotton. Early termination of watering combined with heavy application of nitrogen decreased fiber strength, micronaire and yarn strength. In two other experiments three frequencies of watering were combined factorially with several rates of application of nitrogen. Frequent watering combined with heavy application of nitrogen decreased uniformity of fiber length, micronaire and yarn strength and appearance. In both experiments application of nitrogen increased fiber length. The practical significance of these experiments to farmers is also discussed. (Jamail-Arizona)
W77-01910

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

SIGNIFICANCE OF HYGIENIC INVESTIGATIONS IN SOLVING PROBLEMS OF PROTECTING SURFACE WATERS AT THE CURRENT STAGE, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 5G.
W77-01553

TRANSIENT DRAINAGE WITH NONLINEARITY AND CAPILLARITY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W77-01633

SOME CONSIDERATIONS ON THE ESTABLISHMENT OF THE HIGH AND LOW WATER LEVEL PLANES IN THE GREAT LAKES AREA,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2H.
W77-01637

PROCEEDINGS OF THE NATIONAL WETLAND CLASSIFICATION AND INVENTORY WORKSHOP, 1975.
Fish and Wildlife Service, Washington, D. C. Office of Biological Services.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 079, Price codes: A16 in paper copy, A01 in microfiche.
Conducted by The Wildlife Management Institute. Held at University of Maryland, College Park, Maryland, July 20-23, 1975. 248 p., Addendum of 110 p. July 1976. Edited by J. Henry Sather, Western Illinois University.

Descriptors: *Wetlands, *Classification, *Aquatic habitats, *Marsh management, *Conferences, Marshes, Marsh plants, Animal groupings, Terrestrial habitats, Wildlife habitats, *Habitats, Plant groupings, *Ecosystems, Environment.
Identifiers: *National Wetlands Inventory, Wetlands classification.

Workshop participants represented most Federal and State agencies and private organizations intimately involved in work with wetlands. Participants described the current involvement of their organizations in wetland work. The major portion of the workshop was devoted to a critical examination of a proposed new wetland classification system. Suggestions emanating from the workshop were incorporated in a revised draft of the classification system. A copy of the revised draft entitled, 'Interim classification of Wetlands and Aquatic Habitats of the United States,' is appended to the Proceedings. The interim classification system will now be subjected to intensive field testing prior to the preparation of a final revision. (FWS)
W77-01682

A MATHEMATICAL MODEL FOR PREDICTING RIVER TEMPERATURES-APPLICATION TO THE GREEN RIVER BELOW FLAMING GORGE DAM,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
J. J. Sartoris.
Report REC-ERC-76-7, April 1976. 28 p, 6 fig, 6 tab, 10 ref, 4 append.

Descriptors: *Temperature control, Computer programs, Intakes, *Mathematical models, Fish conservation, Utah, Colorado, Wyoming, *Reservoir releases, Reservoirs, River forecasting, *Water temperature, Computer models.
Identifiers: Empirical equations, *Green River(Utah-Colo), Flaming Gorge Reservoir(Utah-Wyo).

The purpose was to evaluate the effect of selective withdrawal modifications at Flaming Gorge Dam on temperatures in the Green River downstream. A computerized mathematical temperature model, incorporating the conservation of heat equation and an equilibrium temperature approach to heat exchange, was developed. The model was calibrated, using 1974 average daily meteorological and hydrological data, to observed temperatures at three river stations, covering a total distance below the dam of 70.0 kilometres (43.5 river miles). The average monthly error between predicted and observed mean daily river temperatures at these stations ranged from 0 to -1.2C (0 to -2.2F). The calibrated model was used to simulate river temperatures for the case of only two penstock intake structures modified for selective withdrawal and for all three intakes modified. Simulation results indicate that, while the two-intake modification strategy would result in river temperatures significantly nearer the optimum fishery range than those recorded in 1974, operation with all three intakes modified would generally result in optimum fishery temperatures from May through September. The computer model developed could be adapted to a variety of

data and stream conditions. (Bureau of Reclamation)
W77-01684

ASSESSMENT OF WATER AND RELATED LAND RESOURCES, 1975. INITIAL IDENTIFICATION OF WATER AND RELATED LAND PROBLEMS IN NEW ENGLAND,
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 6G.
W77-01688

THE ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM. FIRST YEAR WORK PRODUCT: VOLUME I; THE LEGAL FRAMEWORK: LAKE MICHIGAN AND ITS SHORE,
For primary bibliographic entry see Field 6E.
W77-01689

THE RIVER'S REACH. CONNECTICUT RIVER SUPPLEMENTAL FLOOD MANAGEMENT STUDY. OUTDOOR RECREATION IMPACTS. PHASE II. PART V,
Bureau of Outdoor Recreation, Philadelphia, Pa. Northeast Regional Office.
For primary bibliographic entry see Field 6B.
W77-01694

CONNECTICUT RIVER BASIN PROGRAM. PHASE II. WATER QUALITY IMPACT EVALUATIONS ON FLOOD PROTECTION MEASURES FOR THE CONNECTICUT RIVER SUPPLEMENTAL STUDY.
Environmental Protection Agency, Boston, Mass.
For primary bibliographic entry see Field 5G.
W77-01695

A REPORT TO THE NEW ENGLAND RIVER BASINS COMMISSION ON NON-STRUCTURAL MEASURES FOR FLOOD PLAIN AND FLOOD DAMAGE MANAGEMENT WITH APPLICATION TO THE CONNECTICUT RIVER BASIN SUPPLEMENTAL FLOOD MANAGEMENT STUDY. PHASE II. THE FORMULATION AND EVALUATION OF SPECIFIC ALTERNATIVES,
Cheney, Miller, Ellis and Associates, Inc., Putnam, Conn.
For primary bibliographic entry see Field 6F.
W77-01696

CERTAIN CHARACTERISTIC FEATURES OF FLOWERING AND POLLINATION IN DUCKWEEDS (LEMNACEAE S. GRAY),
I. Y. Ivanova.
NASA TT F-16,483, August 1975. 21 p. Translated from Botanicheskiy Zhurnal, Vol. 55, p. 649-659, May 1970. 5 fig, 1 tab, 22 ref.

Descriptors: *Palynology, *Aquatic weeds, *Floating plants, Flowering, Pollen, Reproduction, Speciation, Water chemistry, Aquatic weed control, Water pollution control, Ponds.
Identifiers: *Duckweed, Wolffioidea, Lemnoideae.

The palynological mechanisms of the subfamilies Wolffioideae and Lemnoideae of the family Lemnaceae are detailed based on observations during 1968 of flowering Lemna in Novgorod, USSR, ponds. Because of Lemna's extremely rare flowering habit little is known and a great deal of conjecture exists in the literature. During the flowering period of L. trisulca and L. gibba, the chemical properties of the water under the plants were compared with artificial solutions and showed differences in content of macro- and microelements. The concentrations of calcium and magnesium ions and sulfates in the natural solution were 3 to 10 times greater, whereas the magnesium and copper contents were 5 to 10 times less, and no zinc was present. The water beneath L. gibba contained no manganese. The conclusions are that cross-pollination is possible due to the fact that the stigma becomes receptive to pollen long before the staminode of the same plant emerges. Self-pollination is possible because the stigma retains viability even after maturation of the pollen of the same plant. If cross pollination had not yet occurred, the stigma turns its mouth upward beneath the anthers of its own staminode, thus duckweeds show great plasticity of reproductive apparatus and are capable of using insects, the wind, as well as autogamy. (Auen-Wisconsin)
W77-01778

GRAPHIC DISPLAY OF WATER RIGHTS AND WATER RESOURCE INFORMATION FOR THE YAKIMA RIVER BASIN AS AN AID TO DECISION-MAKING,
Central Washington State Coll., Ellensburg. Dept. of Geography.
For primary bibliographic entry see Field 6B.
W77-01808

NITRATE AND PHOSPHATE: TIME-TREND CONCENTRATIONS IN SELECTED KANSAS STREAMS,
Kansas Water Resources Research Inst. Manhattan.
For primary bibliographic entry see Field 5B.
W77-01818

EVALUATION OF EFFECTIVENESS OF RESERVOIR DESTRATIFICATION,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W77-01821

VERIFICATION OF HYDROELASTIC SIMILITUDE CRITERIA,
Research Inst. for Water Resources Development, Budapest (Hungary). Dept. for Hydromechanics.
For primary bibliographic entry see Field 8B.
W77-01880

DESIGN OF SURFACE WATER DATA NETWORKS FOR REGIONAL INFORMATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W77-01885

MODELE D'AMENAGEMENT ET DE GESTION D'UN GRAND BASSIN HYDROGRAPHIQUE, (A MODEL FOR THE DESIGN AND MANAGEMENT OF A LARGE HYDROGRAPHIC BASIN),
Ecole Nationale Superieure des Mines de Paris, Fontainebleu (France). Center for Geological Information.
G. De Marsily, P. Hubert, L. Paschini, and P. Ramain.
Hydrological Sciences--Bulletin, Vol. 21, No. 1, p 69-76, March 1976. 2 fig. (Paper from Symposium and Workshops--Bratislava, September 1975: Application of Mathematical Models in Hydrology and Water Resources Systems).

Descriptors: *River basins, *Management, *Forecasting, *Water resources, Design, Economics, Linear programming, Optimization, Water policy, Decision making, Water quality control, Mathematical models, Systems analysis.
Identifiers: *Hydrographic basins.

The forecasting model presented herein constitutes the basic element for the methodology for the design and management scheme proposed. Industrialized countries' water is not presently a limiting factor in economic and social development, although the deterioration of water quality does pose some problems. A dual objective will therefore be set for water management: the safeguarding and perhaps improvement of water quality as well as satisfying the needs of the users. The monetary criterion, with the dangers associated with it (notably the selection of a rate of realization) would in itself only reflect the 'capital' of a water management project and therefore must not be retained as the sole criterion for choice. The search for the management solution at the least cost has little chance of satisfying each of the numerous decision makers interested in the management of a basin. Efforts are thus directed to the determination of 'satisfactory' solutions, each of them being optimal compared with an explicit water policy. With these satisfactory solutions are associated technical, ecological and financial parameters which allow the decision makers to compare solutions and finally to express a choice. (Bell-Cornell)
W77-01887

FLOW RESISTANCE AND INTAKE CHARACTERISTICS OF IRRIGATION FURROWS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 3F.
W77-01893

PROVIDING FOR PROVIDENT DOGONS,
For primary bibliographic entry see Field 3B.
W77-01896

TWENTY-SIX-YEAR CYCLICAL DISTRIBUTION OF DROUGHT AND FLOOD IN CEARA, BRAZIL,
California State Univ., Fresno.
For primary bibliographic entry see Field 2B.
W77-01897

FLASH FLOODS.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 2E.
W77-01933

COLLECTION AND PROCESSING SYSTEM OF HYDROLOGICAL DATA DURING FLASH FLOODS ON THE RIVER YODO,
Kyoto Univ. (Japan).
For primary bibliographic entry see Field 2E.
W77-01934

OPERATIONAL ARRANGEMENT OF RAIN-GAUGE STATIONS IN FORECASTING FLASH FLOODS,
Kyoto Univ. (Japan).
T. Ishihara, and Y. Ishihara.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 73-80, 1974. 5 fig, 6 ref.

Descriptors: *Flash floods, *Flood forecasting, *Networks, *Watersheds(Basins), Mathematical models, Hydrographs, Rivers, Floods, Regional analysis, Runoff, Rainfall-runoff relationships, Network design, Hydrologic data, Design, River basins.
Identifiers: *Japan.

A flash flood is caused by a heavy rainfall concentrated in a short time and a small area. The predominant components of runoff during such a flood result from overland flow and prompt interflow. These facts suggest that the efficient arrangement of rain gage stations in forecasting flash floods must be found with consideration of areal variation of rainfall and the topographical features of a river basin. After discussing the formation process of a flash flood hydrograph by introducing the geomorphological knowledge of a river basin and the empirical characteristics of heavy rainfalls, it was shown, using the example of a

Japanese river, that several rain gage stations can be arranged efficiently for flash flood forecasting. It was concluded that two or three operationally arranged rain gage stations are the minimum required for a river basin of less than several hundred square kilometers area; five or perhaps eight stations are necessary for a larger river basin. (See also W77-01933) (Humphreys-ISWS)
W77-01938

WARNING SYSTEM FOR SEVERE FLOODS,
Water Survey of Canada, Calgary (Alberta).
For primary bibliographic entry see Field 7B.
W77-01939

FLOOD MEASUREMENTS IN AN URBAN ENVIRONMENT: A DATA USER'S VIEWPOINT,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
E. F. Schulz, N. S. Grigg, L. S. Tucker, and W. J. Shoemaker.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 87-92, 1974. 12 ref.

Descriptors: *Urban runoff, *Cities, *Flood control, *Flood data, Measurement, Hydrologic data, Urban hydrology, Urban drainage, Flood protection, Hydrology, Model studies, Management, Planning.

The need for flood measurements in an urban environment was shown, and the role of a local flood control district in helping local governmental entities was outlined. The value of a coordinated plan in the preparation, execution, and operation of flood control measures was discussed. The need for high-quality flood data was emphasized. The problems of measuring floods on small, ephermeral streams in an urban environment were discussed. The possible uses of the data were outlined. It was concluded that flood measurements are essential in an urban environment for: (1) planning purposes, (2) developing model parameters, (3) project operations, and (4) public relations and assessment of project performance. (See also W77-01933) (Humphreys-ISWS)
W77-01940

THE OPERATIONAL USE OF DIGITAL RADAR DATA FOR FLASH FLOOD MONITORING,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 7B.
W77-01941

SYSTEMS FOR PREPARING TIMELY FLASH FLOOD WARNINGS,
National Weather Service, Silver Spring, Md. Office of Hydrology.
M. M. Richards, and R. A. Clark.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 106-109, 1974. 1 fig.

Descriptors: *Flash floods, *Warning systems, *Monitoring, *Flood forecasting, Forecasting, Control systems, Data collections, Data transmission, Instrumentation, Floods.

In the United States, floods in which water levels rise very rapidly are commonly referred to as flash floods. The techniques used to forecast flash floods are basically no different from those required for floods in which water levels rise more slowly. The essential difference is the need to speed up the data collection, forecasting, and dissemination processes when dealing with flash floods. The following 4 ways were suggested to speed up flash flood forecasting: (1) use automation, (2) assist the community in setting up its own flash flood forecasting system, (3) install a flash flood alarm, and (4) use generalized flood watches and warnings. (See also W77-01933) (Humphreys-ISWS)
W77-01942

FLASH FLOODS IN INDIA,
Central Water and Power Commission, New Delhi (India).
For primary bibliographic entry see Field 2E.
W77-01943

THE USE OF REMOTE SENSING SYSTEMS IN MONITORING DESERT FLOODS,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
For primary bibliographic entry see Field 7B.
W77-01944

SNOW DAMAGE IN ARIZONA PONDEROSA PINE STANDS,
Forest Service (USDA), Tempe, Ariz.; Forest Hydrology Lab.; and Forest Service (USDA), Tempe, Ariz. Rocky Mountain Forest and Range Experiment Station.
P. F. Ffolliott, and J. R. Thompson.
USDA For. Serv. Res. Note RM-322, 2 p.

Descriptors: *Forest management, *Snow, *Ponderosa pine, *Arizona.
Identifiers: *Snow damage, *Thinning(Trees).

Snow damage in three cutover ponderosa pine stands was evaluated following a year of record snowfall in north-central Arizona. Susceptibility to bending decreased as diameter at breast height increased. Dense sapling stands suffered significantly more damage than thinned areas. Thinning early in the sapling stage is recommended to reduce the snow damage potential. (Forest Service)
W77-01949

WATER QUALITY ANALYSIS, UPPER MISSISSIPPI RIVER BASIN.
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W77-01953

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, COLUMBIA RIVER.
Parametrix, Inc., Seattle, Wash.
For primary bibliographic entry see Field 5G.
W77-01955

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, UPPER RIO GRANDE,
Academy of Natural Sciences of Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W77-01956

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, HOUSATONIC RIVER,
Lawler, Matusky and Skelly Engineers, Tappan, N. Y.
For primary bibliographic entry see Field 5G.
W77-01957

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, GUADALUPE-SAN ANTONIO RIVER BASIN,
Water Resource Engineers, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W77-01962

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, ST. JOHN RIVER ESTUARY (FLORIDA),
Atlantis Scientific, Tallahassee, Fla.
For primary bibliographic entry see Field 5G.
W77-01964

WATER QUALITY ANALYSIS, THE POTOMAC RIVER.
GKY and Associates, Alexandria, Va.
For primary bibliographic entry see Field 5G.
W77-01968

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, HAWAII.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01970

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, PUERTO RICO.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01971

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, SOUTH PLATTE.
Tetra-Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01972

WATER POLLUTION CONTROL LAW OF 1972, REGIONAL IMPACTS, KANAWHA RIVER.
Dames and Moore, Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W77-01975

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, SANTEE RIVER BASIN.
Academy of Natural Sciences of Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W77-01976

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, ST. JOHN RIVER (MAINE).
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W77-01977

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, DELAWARE RIVER BASIN, (PARTS 1, 2, AND 3).
Betz Environmental Engineers, Inc., Plymouth Meeting, Pa.
For primary bibliographic entry see Field 5G.
W77-01978

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, CHATTAHOOCHEE-FLINT-APALACHICOLA, (PARTS 1 AND 2).
Hammer, Siler, George Associates, Atlanta, Ga.
For primary bibliographic entry see Field 5G.
W77-01980

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, OHIO RIVER BASIN, (VOLUMES 1 AND 2).
Dames and Moore, Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W77-01981

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 7. LOWER MISSISSIP-

PI RIVER BASIN--VOLUME 1. LOWER MISSISSIPPI RIVER BASIN EXCEPT ARKANSAS RIVER BASIN.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-02009

BIBLIOGRAPHY AND SELECTED ABSTRACTS OF REPORTS ON WATER RESOURCES AND RELATED SUBJECTS FOR ARKANSAS THROUGH 1975,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 10C.
W77-02014

ISOTOPIC HYDROLOGY IN THE AMAZONIA 2. RELATIVE DISCHARGES OF THE NEGRO AND SOLIMOES RIVERS THROUGH O-18 CONCENTRATIONS,
Centro de Energia Nuclear na Agricultura, Sao Paulo (Brazil); and Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W77-02016

SIMULATION OF FOREST CHANGES RELATED TO HYDROLOGIC VARIABLES IN THE ATCHAFALAYA RIVER BASIN, LOUISIANA,
Geological Survey, Jackson, Miss.
M. E. Jennings, and C. P. O'Neil.
Journal of Research of the U.S. Geological Survey, Vol 4, No 4, p 481-489, July-August 1976. 3 fig, 7 tab, 5 ref.

Descriptors: *Forest watersheds, Hydrologic properties, *Vegetation effects, *Growth rates, *Model studies, Regression analysis, Statistical methods, Mixed forests, Succession, Swamps, Land use, Surface waters, Evaluation, Environmental effects, Watershed management, *Louisiana.
Identifiers: *Atchafalaya River Basin(La).

Results of forest-trend modeling from one data set in the Atchafalaya River basin, Louisiana, show that predicted forest acreage totals for 16 forest types agree within 30 percent of actual values in two-thirds of the comparisons. A forest-trend simulation model based on statistical regression relations of forest and hydrologic variables and constrained by forest succession concepts was developed using observed data from twenty-four 8-square-mile (20.74-square-kilometer) quadrats. Forest and hydrologic data at each quadrat were sampled in time at three 4-mile (6.44-kilometer)-wide strips across the basin. The model predicts changes in forest-type acreages due to hydrologic change in time steps, or forest acreage transition, of 21 years. Further basin-wide quadrat simulations are planned using hydrologic input data from a flow-sediment model of the basin currently being developed. (Woodard-USGS)
W77-02019

FLOOD CHARACTERISTICS OF STREAMS IN OWYHEE COUNTY, IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 2E.
W77-02027

THERMAL MODELING AND ITS RELATION TO CANAL EVAPORATION,
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 2D.
W77-02029

WATER-TEMPERATURE CHANGES DOWNSTREAM FROM A MAJOR RESERVOIR AT CANNONSVILLE, N.Y.,
Geological Survey, Harrisburg, Pa., and Geological Survey, Reston, Va.
R. E. Fish, and N. Yotsukura.
Paper presented at Irrigation and Drainage Specialty Conference, ASCE, Ottawa, Ontario, Canada, July 21-23, 1976. 18 p, 7 fig, 1 tab, 7 ref.

Descriptors: *Water temperature, *Reservoir releases, *Streamflow, *Heat transfer, *Delaware River, *New York, Mixing, Convection, Data collections, Instrumentation.
Identifiers: *Cool water releases, Ambient temperature, *Cannonsville Reservoir(NY).

The mean temperature of cool bottom water released from Cannonsville Reservoir, Cannonsville, N.Y., into the Delaware River basin at rates of 500-2,000 cubic feet per second (15-60 cubic meters per second) during summer months increased 13C Celsius in reaching ambient temperature about 65 miles (105 kilometers) downstream. The relation between temperature increase and distance can be approximated by an exponential equation in which a constant is used for the coefficient of heat exchange at the air-water interface. The optimum value for the coefficient was 0.00004 feet per second. (Woodard-USGS)
W77-02030

HYDROLOGIC UNIT MAP--1974, STATE OF NORTH DAKOTA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W77-02031

WATER HYACINTHS AND ALLIGATOR WEEDS FOR REMOVAL OF SILVER, COBALT, AND STRONTIUM FROM POLLUTED WATERS,
National Space Technology Labs., Bay St. Louis, Miss.
For primary bibliographic entry see Field 5G.
W77-02037

OPTIMIZING SELECTION OF MARINE RETAINING WALLS,
Mueser, Rutledge, Wentwork and Johnston, New York.
For primary bibliographic entry see Field 8F.
W77-02072

4B. Groundwater Management

SHUNT LINE METERING SYSTEM FOR IRRIGATION WELLS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
For primary bibliographic entry see Field 8G.
W77-01623

QUALITY OF GROUND WATER IN THE COASTAL AQUIFER NEAR VISAKHAPATNAM, INDIA,
Andhra Univ., Waltair (India). Dept. of Geophysics.
For primary bibliographic entry see Field 5B.
W77-01626

HYDROCHEMISTRY AND GROUND-WATER MIXING IN PART OF THE LINCOLNSHIRE LIMESTONE AQUIFER, ENGLAND,
Birmingham Univ. (England). Dept. of Geological Sciences; and Birmingham Univ. (England). Hydrogeology Section.
For primary bibliographic entry see Field 2F.
W77-01627

HYDROLOGY AND CHEMISTRY OF GROUND WATER IN PUNA, HAWAII,
Colorado School of Mines, Golden. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W77-01628

DETERMINING THE SOURCE OF NITRATE IN GROUND WATER BY NITROGEN ISOTOPE STUDIES,
Texas Univ. at Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 5A.
W77-01636

METHOD FOR PRODUCING MECHANICAL ENERGY FROM GEOTHERMAL BRINE,
Union Oil Co. of California, Brea. (Assignee).
For primary bibliographic entry see Field 3C.
W77-01710

ARTESIAN AQUIFERS,
National Water Well Association, Worthington, Ohio.
T. E. Gass.
Water Well Journal, Vol. 30, No. 1, p 28-29, November, 1976. 3 fig.

Descriptors: *Aquifers, *Aquifer characteristics, *Groundwater, Potentiometric level, Saline water intrusion, Water wells, *Artesian wells, *Confined water.

Artesian aquifers are aquifers which contain ground water under pressures higher that at normal atmospheric pressure. These aquifers are confined by impermeable beds, usually clay or shale, which limit the ground water to in the aquifer. Inclination of the aquifer increases the hydrostatic pressure of the ground water due to the overlying waters weight exerted on the water the lower part of the aquifer. Water well drilled into the lower part of the aquifer will produce wells with water levels which equal the height of the higher saturated aquifer reservoir, less the pressure drop caused by frictional loss. This principal can be illustrated in physical models. No confining layer is entirely impermeable. Where hydrostatic pressure is low water will migrate slowly through the confining layer toward the low pressured area. This can be a problem where water of objectionable chemical quality migrates into the artesian aquifer. (Heiss-NWWA)
W77-01761

40 GPM. IT WORKS IF YOU HAVE ENOUGH WELLS,
J. Blair.
Irrigation Age, Vol. 11, No 2 p 22, October, 1976. 1 fig.

Descriptors: *Water wells, Irrigation groundwater, Water table, Texas, Loam, *Distribution systems, *Irrigation practices, Irrigation efficiency, Pumping, Plastic pipes, Subsurface irrigation.
Identifiers: *Groundwater depletion.

Irrigation around St. Lawrence, Texas, was started on a hit-or-miss fashion over 20 years ago. With the heavy clay loam soils and 16 inch rainfall, farmers turned to water well irrigation to supplement the erratic rainfall. Water was found between 200 to 250 feet and produced at an average rate of 100 gpm. Because of limited recharge rates and over pumping after a number of years the water yield dropped to 30 or 40 gpm, causing irrigation farmers to use several smaller wells rather than the larger wells of the past. Farmers now drill small holes and use electrical submersible pumps that operate at 5 to 7 1/2 horsepower. A norrow 30 inch deep ditch was then dug for the installation of 4-inch, plastic water distribution pipe. The underground pipe connects two or three small wells and leads to the head of the irrigation block, where 4-inch gated aluminum pipe is used for water outlets. One problem the community will someday face is that of a dropping water table. It is now about 300 feet and drops about 1 foot every year. (Grober-NWWA)
W77-01762

GROUND WATER FLOW IN UNCONSOLIDATED FORMATIONS,
National Water Well Association, Worthington, Ohio.
T. E. Gass.
Water Well Journal, Vol. 30, No. 10, p 22-23, October, 1976. 4 fig.

Descriptors: *Groundwater, *Recharge, *Drawdown, Water flow, Permeability, Pumping, Water table, Aquifers, Unconsolidated aquifers.
Identifiers: *Cone of depression, Pumping rates, Boundary conditions.

Drawdown is the difference between original static water level and water level during pumping. Drawdown is greatest in the well and decreases in all directions away from the well, forming the cone of depression. Because water in the pumped well is lower than surrounding formations, water moves from the formation into the well. The velocity of water flowing toward the well is a function of the permeability of the porous media. The cone of depression is a function of permeability and hence velocity. Depending on variations in pumping rate, length of pumping period, aquifer characteristics, slope of water table, and amount of recharge available in the vicinity of the well, the shape of each cone of depression will vary. If two wells share an aquifer and their cones of depression intersect, forming a composite cone of depression that is the sum of the individual cones. The shape of the cone of depression will frequently be affected by the boundary conditions encountered as the cone expands. Boundary conditions are changes in the permeability and recharge characteristics of the aquifer produced by faults, changes in rock composition, and interaction of ground water and surface water bodies. As aquifer recharge increases the cone of depression will become less pronounced in that aquifer. (Grober-NWWA)
W77-01763

NEARLY 50,000 NEBRASKA WELLS CAUSING SOME CONCERN.
Irrigation Age, Vol. 11, No. 2, p 20, October, 1976. 1 fig.

Descriptors: *Water wells, *Irrigation, Water table, *Nebraska, Legislation, Regulation, Water law, Withdrawal, Pumping.
Identifiers: *Groundwater depletion, Nebraska Legislative Bill 577.

Nebraska is expected to become the 'most irrigated' state in the nation within the next decade. The number of wells drilled annually in Nebraska has nearly doubled since 1970. As of last year, there were a total of 46,483 wells statewide. Center pivot irrigation has emerged as the predominant method of water application. Along with economic growth, however, has come apprehension over declining water tables and concern for more efficient use of existing water supplies. 'We're getting some reports of groundwater supplies declining consistently from one to three feet annually', says Dr. Les Sheffield, University of Nebraska irrigation development coordinator. One reaction to the problem has been increased emphasis on water conservation, Sheffield reports. Farmers could make substantial water savings through irrigation scheduling programs. Another water-saving measure in effect is Nebraska's Legislative Bill 577, which gives authorization to the state's Natural Resource Districts (NRD's) to declare irrigation control areas. The bill authorizes the NRD's to register wells, increase well spacing, allocate maximum well withdrawals for various crops, order rotation pumping and declare a moratorium on further well drilling for up to one year as a final resort. Proponents of water conservation further suggest that Nebraska must develop additional methods of preserving and utilizing off-season high river and stream flows. Farmers across Nebraska agree that irrigation development has come on far more rapidly that expected but say they prefer local solutions over state or federal controls. (Grober-NWWA)
W77-01765

DRAWDOWN DUE TO PUMPING IN AN ANISOTROPIC AQUIFER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R. E. Glover, and W. T. Moody.
Water Resources Bulletin of the American Water Resources Association, Vol. 12, No. 5, p 941-950, October, 1976. 3 ref, append.

Descriptors: *Water wells, *Aquifers, *Drawdown, *Pumping, Permeability, Artesian wells.
Identifiers: *Isotropic aquifers, *Anisotropic aquifers, Cones of depression, Leaky roof anisotropic aquifers.

Formulas for water table or pressure drawdowns due to wells drawing water from isotropic aquifers can be modified for use where the aquifer is nonisotropic. The cases treated are those for a well drawing water from an aquifer at a constant rate, for a well drawing water at a constant rate from an aquifer with a 'leaky roof', and for the flowing artesian well. In all cases the well is considered to completely penetrate the aquifer. The resulting cones of depression formed from pumping an anisotropic aquifer has an oval shape. The length of the major and minor axes of a contour of the cone of depression exhibit the ratio Kx/Ky with Kx the direction of maximum permeability, and Ky in the direction of minimum permeability, which lies at right angles to Kx. (Heiss-NWWA)
W77-01769

RURAL RESIDENTIAL WATER DEMAND: AN ECONOMETRIC AND SIMULATION ANALYSIS,
Kentucky Univ., Lexington. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6D.
W77-01770

MONITORING GROUND-WATER QUALITY: METHODS AND COSTS,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01771

MONITORING GROUNDWATER QUALITY: ILLUSTRATIVE EXAMPLES.
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01772

MONITORING GROUNDWATER QUALITY: DATA MANAGEMENT,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01773

MONITORING GROUNDWATER QUALITY: MONITORING METHODOLOGY,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01775

A MANUAL OF LAWS, REGULATIONS, AND INSTITUTIONS FOR CONTROL OF GROUND WATER POLLUTION,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W77-01776

MANUAL OF WATER WELL CONSTRUCTION PRACTICES.
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 8B.
W77-01777

ALTERNATIVES IN AREA MANAGEMENT OF GROUNDWATER,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
L. K. Fischer.
Nebraska Water Resources Research Institute, Lincoln, Completion Report, September 1976. 53 p, 11 ref, 3 append. OWRT B-026-NEB (1). 14-31-0001-4102.

Descriptors: *Groundwater, Water management(Applied), *Water rights, Water law, *Nebraska, *Alternative planning, *Irrigation wells, *Withdrawal, Recharge, Aquifers.

In much of Nebraska irrigation wells are continuing to be installed rapidly in areas where water tables are already declining. This intensive development is in response to economic incentives and a legal system which, in operation, is basically the 'law of capture.' Additional incentives are provided by the 'common pool' nature of the resource. Each landholder is induced to develop irrigation by the knowledge that the water will be withdrawn from beneath his land whether or not he makes use of it. Also, many landholders believe, with considerable justification, that withdrawal of water will be restricted in the future and the right to pump water will be based, at least in part, on the history of use. The results of this study indicate that efficient and profitable irrigation on a perpetual basis can be achieved if average rates of withdrawal of water from groundwater aquifers having a significant rate of recharge, are limited to average rates of recharge prior to the economic exhaustion of water in storage. The essence of a practical system of water rights seems to involve, on the one hand, reservation in the public domain of rights to water necessary to provide for public needs and to protect the public interest. The remaining rights should be in private hands. Individual action with respect to the exercise and transfer of private water rights should be restricted only to the extent necessary to protect legitimate public and third-party interests.
W77-01819

SHALLOW GROUND-WATER SALINIZATION IN DRYLAND FARM AREAS OF MONTANA,
Montana Univ., Missoula. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-01822

ANNUAL OPERATION OF A COASTAL GROUNDWATER BASIN AT A PRESCRIBED RELIABILITY LEVEL,
Ministry of Agriculture, Jerusalem (Israel). Hydrological Service.
Y. Bachmat.
Journal of Hydrology (Amsterdam), Vol. 31, No. 1/2, September 1976, p 97-118. 4 fig, 5 ref.

Descriptors: *Groundwater basins, *Coastal engineering, *Water management(Applied), *Hydrologic aspects, Reliability, Statistical models, Operations research, Equations, Pumping, Storage, Constraints, Water supply, Aquifers, Optimization, Sampling, Model studies.
Identifiers: *Annual operation, Seawater intrusion, Benefit maximization, Israel, Dynamic models, Confidence interval, Natural outflow.

Short-term operation of a groundwater basin is preferably based on a hydrological operating rule. Such a rule is derived for the gross annual pumpage from a single-cell coastal groundwater basin at a prescribed reliability level of supply. The annual pumpage given by the rule consists of a fixed part,

irrespective of the actual storage, and of a flexible part which is proportional to the prevailing actual storage above sea level. The rule rests upon the physical characteristics of the basin, its groundwater balance, the statistical parameters of a random normally distributed natural replenishment and design variables. The dependence of the parameters of the operating rule on the operational and initial storage, as well as on the parameters of the groundwater system, is analyzed. A procedure for deriving the operating rule is formulated and application of the procedure is illustrated on the coastal groundwater basin in Israel. Possible extensions of the rule are suggested. (Bell-Cornell)
W77-01882

A MODEL STUDY OF THE EFFECTS OF ARTIFICIAL RECHARGE,
Department of the Environment, Reading (England). Central Water Planning Unit.
D. A. Nutbrown.
Journal of Hydrology (Amsterdam), Vol. 31, No. 1/2, p 57-65, September 1976. 5 fig, 3 ref.

Descriptors: *Artificial recharge, *Model studies, *Groundwater, Effects, River regulation, Storage, Flow, Aquifers, Long-term planning, Analytical techniques, Estimating, Systems analysis, Equations.
Identifiers: United Kingdom, Transient analysis.

Some simple analytic and numerical results are obtained which may be used to derive preliminary estimates of the effects of artificial recharge on the storage and flow of groundwater in an unconfined aquifer. In particular, two situations are considered. In the first, a steady-state approach is adopted to describe the long-term effects of recharge and an analytic expression is obtained giving values of the resulting increase in storage. These values compare well with model recharge experiments performed with a detailed description of groundwater flow in the Chalk of the South Downs, U.K. In the second situation, some numerical results are obtained from a transient analysis which describes the seasonal effects of recharge, both on aquifer outflow and storage. These results are relevant to the use of artificial recharge to supplement groundwater storage for river regulation and direct-supply purposes. (Bell-Cornell)
W77-01883

OPTIMAL MANAGEMENT OF THE SUBSURFACE ENVIRONMENT,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
R. Willis.
Hydrological Sciences--Bulletin, Vol. 21, No. 2, p 333-344, June 1976. 29 ref.

Descriptors: *Water resources, *Management, *Groundwater basins, *Water quality control, Optimization, Mathematical models, Aquifers, Waste assimilative capacity, Waste water treatment, Pumping, Recharge, Costs, Water demand, Planning, Equations, Flow, Darcys law, Algorithms, Decision making, Systems analysis.
Identifiers: Cost minimization, Galerkin method, Mass transport.

A mathematical model for the optimal, conjunctive management of a groundwater basin's quality and quantity resources is presented. The quality resource, the assimilative waste capacity, is the ability of the aquifer to degrade certain nonconservative constituents through the actions of molecular diffusion, hydrodynamic dispersion, adsorption, biochemical reactions and convective mass transport. The model is applicable to saturated, isothermal, porous media. The Galerkin method is used to express the spatial and temporal variations in hydraulic head and constituent concentrations as a function of possible recharge, pumping, and treatment decisions. The Galerkin procedure ensures that the constraint equations actually model the response characteristics (flow and mass transport) of the groundwater basin. In each planning period, the groundwater basin is required to meet an exogenous water demand while maintaining adequate water quality levels throughout the aquifer. The model, structured as a mathematical program, minimizes the sum of waste water treatment and pumping and recharge costs. The results indicate (1) the feasibility of conjunctive management of an aquifer's quality and quantity resources, and (2) that the assimilative waste capacity can function as a form of secondary or advanced waste water treatment. (Bell-Cornell)
W77-01884

DIFFERENTIAL-HEAD--LAKE-LEVEL RELATIONSHIPS IN THE MIDDLE-GULF AREA, FLORIDA,
Water and Air Research, Inc., Gainesville, Fla.
H. E. Hudson, Jr.
Ground Water, Vol. 14, No. 5, p 278-282, September-October 1976. 6 fig, 1 tab, 11 ref.

Descriptors: *Groundwater, *Pumping, *Florida, Groundwater movement, Lake bottom springs, Lakes, Wells, Well spacing, Aquifers, Aquifer management, Limestone, Hydrology.
Identifiers: *Lake level, Water levels, Lake behavior, Lake dredging.

Large well-field developments in the Mid-Gulf area of Florida have caused abnormal lowering of nearby lakes. A map showing the differential head between the surficial aquifer and the underlying limestone Floridan aquifer indicated values ranging from 20 feet to zero at a location where the aquiclude is absent. Lake levels had been restored by pumping from limestone wells. From pumping data and analysis of recession limbs, lineal relations between recession rates and differential head appeared to exist. From these, leakance values and vertical permeabilities were determined, with the latter values for two distinctly different sites ranging from 0.02 to 200 gpd/sf. (Lee-ISWS)
W77-01922

EVIDENCE OF SALT-WATER INTRUSION IN SOUTHEASTERN LONG ISLAND,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W77-01924

DRAWDOWN DUE TO PUMPING IN AN ANISOTROPIC AQUIFER,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R. E. Glover, and W. T. Moody.
Water Resources Bulletin, Vol. 12, No. 5, p 941-950, October 1976. 3 ref, append.

Descriptors: *Drawdown, *Pumping, *Anisotropy, Aquifers, Equations, Permeability, Water wells, Artesian aquifers, Leakage, Dupuit-Forchheimer theory, Saturated flow, Mathematical studies.
Identifiers: *Cone of depression, Flowing well.

A variable change was used to convert drawdown formulas for isotropic aquifers for use where the aquifer is anisotropic. Contours of the cone of depression assume an oval configuration with the major and minor axes oriented in the directions for which the permeability is greatest and least. The case of a well pumped at a constant rate, the case of a well drawing water at a constant rate from an aquifer with a leaky roof, and the flowing artesian well case were treated. In all cases, the well was considered to completely penetrate the aquifer. (Visocky-ISWS)
W77-01929

SUBSURFACE FLOW INTERCEPTION BY A LOGGING ROAD IN MOUNTAINS OF CENTRAL IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W77-01948

A MODEL FOR CALCULATING EFFECTS OF LIQUID WASTE DISPOSAL IN DEEP SALINE AQUIFERS, PART I--DEVELOPMENT.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 5B.
W77-02010

BIBLIOGRAPHY AND SELECTED ABSTRACTS OF REPORTS ON WATER RESOURCES AND RELATED SUBJECTS FOR ARKANSAS THROUGH 1975,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 10C.
W77-02014

A DRAWDOWN PREDICTION MODEL BASED ON REGRESSION ANALYSIS,
Geological Survey, Reston, Va.
T. Maddock,III.
Water Resources Research, Vol 12, No 4, p 818-822, August 1976. 1 fig, 3 tab, 5 ref.

Descriptors: *Drawdown, *Water wells, *Groundwater, *Model studies, *Regression analysis, Forecasting, Methodology, Equations, Pumping, Water yield, Water levels, Well spacing.

A technique for determing algebraic technological functions (ATF) relating the drawdown at wells to the quantity of water withdrawn from those wells is developed. The inputs are the time series of historical pumping and water levels, the distances between wells, the radius of the well, and the duration of a pumping period. A stepwise regression analysis is then used to determine the coefficients of the ATF. The functional form of the regression equation is based on standard results from groundwater analysis. (Woodard-USGS)
W77-02015

EFFECT OF HIGH-PRESSURE DEFORMATION ON PERMEABILITY OF OTTAWA SAND,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2F.
W77-02021

GROUND-WATER RECORDS FOR SOUTHEASTERN OKLAHOMA: PART 1--RECORDS FOR WELLS, TEST-HOLES, AND SPRINGS,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 7C.
W77-02024

WATER RESOURCES OF THE LITTLE FORK RIVER WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-02033

4C. Effects On Water Of Man's Non-Water Activities

SNOW-ROAD CONSTRUCTION--A SUMMARY OF TECHNOLOGY FROM PAST TO PRESENT,
Civil Engineering Lab. (Navy), Port Hueneme, Calif.
J. L. Barthelemy.

Available from the National Technical Information Service, Springfield, VA 22161 as ADA-021 868, Price codes: A03 in paper copy, A01 in microfiche. Report TR-831, December 1975. 37 p, 10 fig, 28 ref, append.

Descriptors: *Cold weather construction, *Road construction, *Snow, *Antarctic, Construction materials, Equipment, Compaction, Construction equipment, History, Cold regions, Polar regions, Strength of materials, Civil engineering, Reviews.
Identifiers: *Compacted-snow pavements, Hardening, Depth-processing, Densification, Layer-compaction.

During 1947, Naval Construction Forces built a compacted-snow airstrip on the Ross Ice Shelf in Antarctica. Research methods since then have improved the use of snow as a construction material. Snow-compaction techniques and equipment initially developed by the Civil Engineering Laboratory (CEL) for runway construction have been used to build durable, high-strength roads. At the present time, properly constructed and routinely maintained roads built from specially processed snow can support passenger vehicles, pickups, vans, trucks, and tractor-trailer combinations fitted with flotation tires at gross weights up to 75,000 pounds. Two methods of construction developed by CEL were recommended in this report: (1) layered-compaction, and (2) depth-processing. In layered-compaction, the most recently perfected technique, a snow pavement is elevated to a desired height by compacting successive 4-inch layers using a rotary snowplow to gather, process, and deposit the snow material. The alternative method requires depth-processing, using snow mixers to pulverize material placed on the roadway. This final report documented the evolution of vehicle road systems on snow and presented a synoptic overview summarizing all aspects of snow-road technology from theoretical considerations to historical development and recommended procedures. (Sims-ISWS)
W77-01638

EVALUATION OF THE USE OF SALT BRINE FOR DEICING PURPOSES,
Connecticut Dept. of Transportation, Rocky Hill, Materials Testing Lab.
M. M. Kasinskas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 918, Price codes: A02 in paper copy, A01 in microfiche. Report HPR-PR-PL-1(12), April 1975. 16 p, 10 fig, 1 ref.

Descriptors: *Deicers, *Brines, *Highways, *Snow removal, Laboratory tests, Sodium chloride, Salts, Snowpacks, Highway icing, Roads, Jets, Nozzles, Orifices, Equipment, Economics, Maintenance, Maintenance costs.
Identifiers: Snow plowing, Chemical deicing.

The formation of dense snowpack and ice on high volume roadways is of major concern during snow removal operations. The use of conventional snowplow blades, which normally lack the ability to deeply penetrate a snow cover of this type, results in the excessive use of chlorides, equipment, and time. This report covered both current problems encountered during snow removal operations and a new concept for the removal of a dense snowpack and ice from a pavement surface. The concept proposed using a NaCl brine solution under high velocity jet stream conditions to penetrate a snowpack. It was found that the abrasive qualities of a turbulent boundary layer around a jet stream and the drag produced by the pack in changing the momentum of the brine stream destroy or loosen the pack sufficiently to enable economical and effective plowing. (Sims-ISWS)
W77-01639

WATER YIELDS RESULTING FROM TREATMENTS ON THE WORKMAN CREEK EXPERIMENTAL WATERSHEDS IN CENTRAL ARIZONA,
Rocky Mountain Forest and Range Experiment Station, Temple, Ariz.
L. R. Rich, and G. J. Gottfried.
Water Resources Research, Vol. 12, No. 5, p 1053-1060, October, 1976. 8 fig, 12 ref, 2 tab.

Descriptors: *Water yield improvement, *Watershed management, *Arizona, Water supply, Water yield, Hydrology, Streamflow, Sedimentation, *Forest watersheds, Burning, Lumbering, Grasses waterways, Pine trees, Surface runoff, Ponderosa pinetrees, Instrumentation, Coniferous forests.
Identifiers: *Workman Creek Watershed(Ariz).

The three Workman Creek watersheds were instrumented to determine the hydrology of mixed conifer forests and to determine the changes in streamflow and sedimentation as a result of manipulating the forest vegetation. A small riparian cut on North Fork did not increase water yield. A selection timber harvest, improvement cut, and fire which removed 45% of the basal area on South Fork increased water yields slightly. In contrast, converting 32.4 ha (80 acres) of moist forest site to grass significantly increased water yields on the 100.4-ha (248 acre) North Fork watershed. Water yields were increased even more after 40.5 ha (100 acres) of dry-site pine forest were converted to grass. An increase of 69 mm (2.70 inches), or 84%, of expected runoff resulted from the combined treatment. Clearing 83% of the South Fork watershed preparatory to planting ponderosa pine significantly increased water yields by 93 mm (3.67 inches), or by 111%. (Witt-IPC)
W77-01660

THE EFFECT OF PARK USE ON SURFACE WATER QUALITY,
Max C. Fleischmann Coll. of Agriculture, Reno, Nev. Div. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 5C.
W77-01692

PROJECT PROPOSAL FOR SURFACE-MINED LAND ENHANCEMENT (SMILE),
Federal Energy Administration, Washington, D.C. Office of Coal.
For primary bibliographic entry see Field 5G.
W77-01699

EFFECTS OF URANIUM MINING AND MILLING ON GROUND WATER IN THE GRANTS MINERAL BELT, NEW MEXICO,
Office of Radiation Programs, Las Vegas, Nev.
For primary bibliographic entry see Field 5C.
W77-01923

DISASTERS CAUSED BY FLASH FLOODS,
National Research Center for Disaster Prevention, Tokyo (Japan).
For primary bibliographic entry see Field 2E.
W77-01937

SOME CONSEQUENCES OF AREA WIDE RUNOFF CONTROL STRATEGIES IN URBAN WATERSHEDS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4D.
W77-01947

SUBSURFACE FLOW INTERCEPTION BY A LOGGING ROAD IN MOUNTAINS OF CENTRAL IDAHO,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
W. F. Megahan.
In: National Symposium on Watersheds in Transition, 1972, p. 350-356. 5 fig., 3 tab., 8 ref.

Descriptors: *Subsurface flow, Roads, *Idaho, Slopes, Snowmelt, Erosion, Overland flow, Runoff, Hydraulic conductivity, Soils, Bedrock, Groundwater, *Interception, *Lumbering, Weathering, Granites.
Identifiers: *Idaho Batholith, Mass erosion, Roadents.

Conditions on mountain slopes in the Idaho Batholith are particularly conducive to the formation of subsurface flow. Roads in the area often incise flow levels, thereby transforming subsurface flows into surface flow. A study was designed to measure the amount of subsurface flow intercepted by a road on two representative microwatersheds in the area. Instrumentation included a climatic station; snow lysimeters; a network of snow stakes, soil moisture-access tubes and piezometers; and apparatus to measure surface and subsurface flows. No surface flows occurred at any time. Subsurface flows were restricted to the spring snowmelt periods of 1970 and 1971. Maximum flows occurred during 1971; the volume for that year totaled 8.4 inches per unit area of watershed above the road. Flows varied slightly between watersheds, but were vastly different between years. Yearly differences were related to amounts and to rates of inflow. A comparison of flows from nearby perennial watersheds suggests that the weathered granitic bedrock is more hydrologically active than was previously thought. The amount of subsurface flow intercepted by roads is compared to the flow generated by overland flow for the area disturbed by road construction and the potential for damages is discussed. (Forest Service)
W77-01948

SIMULATION OF FOREST CHANGES RELATED TO HYDROLOGIC VARIABLES IN THE ATCHAFALAYA RIVER BASIN, LOUISIANA,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 4A.
W77-02019

4D. Watershed Protection

LABORATORY TESTING OF WATER-REPELLENT SOIL TREATMENTS FOR WATER HARVESTING,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
D. H. Fink.
Soil Science Society of America Journal, Vol. 40, No. 4, p 562-566, July-August 1976. 3 fig, 2 tab, 13 ref.

Descriptors: *Repellents, *Water harvesting, *Laboratory tests, *Soil treatment, Watersheds(Basins), Soils, Water conservation, Arid lands, Erosion, Weathering, Stabilization, Soil stabilization, Soil science.
Identifiers: *Water repellants, Water repellant soil treatment.

Field testing of repellents for water harvesting is both slow and costly, often hindering the orderly, rapid progression of the technique. Laboratory tests were developed for rapidly evaluating the effectiveness of water-repellent treatments on soils. The effect of accelerated weathering from ultraviolet radiation, ozone, and freeze-thaw cycling on the retention of water repellency and on soil stability was studied. The effect on soil stability of prolonged hydration and water erosion was also considered. Using these laboratory tests, numerous soils, organic materials, and treatment techniques can be quickly evaluated so that field testing can be reserved for only the most promising. A small, representative laboratory study, reported here to illustrate the technique, showed that two repellents (a petroleum resin dust-suppressant oil and paraffin wax) when combined made soil generally more resistant to total

weathering effects than did either repellent alone. The dust suppressant helped to stabilze the soil against damage by freeze-thaw cycling, while the wax protected it from degradation by ultraviolet radiation. These laboratory results compared favorably with observations from field plots treated with these two repellents. (Sims-ISWS)
W77-01621

WATER YIELDS RESULTING FROM TREATMENTS ON THE WORKMAN CREEK EXPERIMENTAL WATERSHEDS IN CENTRAL ARIZONA,
Rocky Mountain Forest and Range Experiment Station, Temple, Ariz.
For primary bibliographic entry see Field 4C.
W77-01660

IMPACT OF WATER RESOURCE DEVELOPMENT ON COASTAL EROSION, BRAZOS RIVER, TEXAS,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W77-01681

A STOCHASTIC SEDIMENT YIELD MODEL FOR BAYESIAN DECISION ANALYSIS APPLIED TO MULTIPURPOSE RESERVOIR DESIGN,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
J. H. Smith.
Master of Science Thesis, 1975. 45 p, 7 fig, 1 tab, 24 ref.

Descriptors: *Stochastic processes, *Sediment yield, *Watershed management, *Reservoir design, Analytical techniques, Mathematical models, Statistical models, Reservoir storage, Linear programming, Dams, Sediments, Water control, Rainfall, Rainfall intensity, Storms, Runoff, Precipitation(Atmospheric), Water storage, Semiarid climates.
Identifiers: *Bayesian decision analysis.

A methodology is presented for obtaining the optimal design capacity for sediment yield in multipurpose reservoir design. A stochastic model is used for prediction of sediment yield in a semi-arid watershed based on rainfall data and watershed characteristics. Uncertainty stems from the random variables used in the model: rainfall amount, storm duration, runoff, peak-flow rate, and number of events per season. Using the stochastic sediment yield model for N- seasons, a Bayesian decision analysis is carried out for a dam site in southern Arizona. Extensive numerical analysis and simplifying assumptions are made to facilitate finding the optimal solution. The model has applications in the planning of reservoirs and dams where the effective lifetime of the facility may be evaluated in terms of storage capacity and of the effects of land management on the watershed. Experimental data from a watershed are used to calibrate the model and evaluate the uncertainities of rainfall distribution and storm duration parameters used in calculating the sediment yield amount. (Jamail-Arizona)
W77-01892

DUST STORMS,
For primary bibliographic entry see Field 2B.
W77-01895

AGRICULTURAL WATER POLLUTION: SOME PROBLEMS ASSOCIATED WITH ITS CONTROL,
Kansas Univ., Lawrence. Dept. of Geography.
For primary bibliographic entry see Field 5G.
W77-01898

RAINFALL EROSIVITY OVER RHODESIA.
Rhodesia Univ., Salisbury. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W77-01901

FIELD MONITORING EQUIPMENT FOR HYDROLOGICAL STUDIES IN A SMALL CATCHMENT,
Bristol Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 7B.
W77-01936

SOME CONSEQUENCES OF AREA WIDE RUNOFF CONTROL STRATEGIES IN URBAN WATERSHEDS,
Washington Univ., Seattle. Dept. of Civil Engineering.
R. A. Hardt, and S. J. Burges.
Charles W. Harris Hydraulic Laboratory, Technical Report 48, June 1976. 81 p., 4 tab., 2 ref., 14 fig. OWRT A-078-WASH(1), 14-31-0001-6050.

Descriptors: *Urban runoff, Rainfall-runoff relationships, Design, Streamflow routing, Runoff, Peak discharge, Water management(Applied), *Water control, Flow control, Urbanization.
Identifiers: Flood mitigation, *Urban watersheds, *Runoff control.

Consequences of 'blanket' runoff control management strategies that require all future developments in urban and suburban areas to maintain peak flow rates from their sites at the level that existed prior to urbanization were examined. Hypothetical watersheds were studied to determine some bounds to the overall runoff management issue. Principal findings indicated that: (1) Runoff control strategies must be evaluated at the entire watershed level, not on local jurisdictional boundaries. (2) Without detailed sub-basin discharge hydrographs and main channel characteristics, the optimum drainage management scheme cannot be established. (3) Runoff volume reduction appears to be one means of achieving more effective runoff control. (4) Restricting the outflow from a retention facility to a level less than the undeveloped rate could achieve a composite peak flow rate that would equal the pre-urbanization flow but would run for a much greater duration at that rate. (5) Longer duration storms falling on the sub-basins under consideration produced higher peaked watershed outflow hydrographs than did shorter, more intense rainfalls. (6) For storm magnitudes greater than the control system design storm, two possibilities exist: a higher peak rate or an equal peak rate to that which would have occurred without control. Mixed control strategies were shown to be useful in some circumstances. Generally, each drainage basin must be examined to determine what management options will work. Blanket policies were shown to be unwise in many situations; administrative convenience is not a panacea for managing urban runoff.
W77-01947

SOUTHEASTERN FORESTS AND THE PROBLEM OF NON-POINT SOURCES OF WATER POLLUTION,
Forest Service (USDA), Franklin, N. C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 5B.
W77-01952

WATER RESOURCES OF THE RAINY LAKE WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-02032

WATER RESOURCES OF THE LITTLE FORK RIVER WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-02033

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

SOME ASPECTS OF NUCLEAR SPIN RELAXATION OF ADSORBED WATER PROTONS IN BIOLOGICAL MATRICES, (IN RUSSIAN),
Institut Fiziki, Krasnoyarsk (USSR).
V. V. Inanov.
Biofizika 20(3), p 394-397, 1975.

Descriptors: *Water properties, *Water structure, *Molecular structure, Adsorption, Biological properties, Physiochemical properties.
Identifiers: *Nuclear spin relaxation, *Water protons.

The theoretical calculation of the nuclear spin relaxation times T1 and T2 of water protons adsorbed on biological matrices is considered for the case of relaxation diffusive mechanism. The influence of the molecular elementary jump realization number and long-range order of the spin interaction on values T1 and T2 is shown.--Copyright 1976, Biological Abstracts, Inc.
W77-01563

SOME ASPECTS OF NUCLEAR SPIN RELAXATION OF WATER ADSORBATE PROTONS IN BIOLOGICAL MATRICES, (IN RUSSIAN),
Institut Fiziki, Krasnoyarsk (USSR).
N. V. Ratinikova, V. V. Ivanov, and Yu. N. Moskvich.
Biofizika 20(3), p 398-402, 1975.

Descriptors: *Water properties, *Water structure, *Molecular structure, Adsorption, Biological properties, Physicochemical properties, Rodents.
Identifiers: Albumin, Biological matrices, *Nuclear spin relaxation.

The structure and mobility of water molecules adsorbed on rat collagen and ovalbumin were investigated by the spin-echo method. The differentiation of adsorbate to 2 subsystems, 1 of which is the hydrate shell of the macromolecules, was found. The molecular exchange between subsystems takes place with temperature-dependent intensities.--Copyright 1976, Biological Abstracts, Inc.
W77-01564

CONCENTRATION OF VIRUSES IN WATER BY THE POLYMER TWO PHASE SYSTEM: QUANTITATIVE STUDY, (IN FRENCH),
Nancy-1 Univ. (France). Unite de d'Enseignement et de Recherche des Sciences Pharmaceutiques.
L. Schwartzbrod, J. C. Block, P. Dixneuf, J. Schwartzbrod, and J. C. Brochet.
C R Seances Soc Biol Fil, 169(3), p 641-644, 1975.

Descriptors: *Viruses, *Pollutant identification, Analytical techniques.
Identifiers: Picornavirus, *Polymer two phase systems, Poliomyelitis.

The sensitivity of the polymer 2 phase system with varying concentrations of viruses in water was studied. This technique agrees with research on poliomyelitis viruses in water; viral recovery is always >74.5%. Average percentages of recovered viruses are always 100% where the initial virus concentrations are 102 or 103/1; if the initial concentration is higher the yield of this method decreases.

W77-01567

CHROMIUM AND MERCURY IN A SOIL AFTER 80 YEARS OF TREATMENT WITH URBAN SEWAGE WATER, (IN GERMAN),
For primary bibliographic entry see Field 2K.
W77-01568

SUBMERSED MACROPHYTES AND THEIR COMMUNITIES AS INDICATORS OF WATER CONTAMINATION,
Universitaet Hohenheim (Landwirtschaftliche Hochschule) (West Germany).
For primary bibliographic entry see Field 5C.
W77-01570

HYDROCARBON DETERMINATION IN WASTE WATERS BY MEANS OF CHANNEL THIN LAYER CHROMATOGRAPHY, (IN ITALIAN),
Rome Univ. (Italy). Istituto di Chimica Analitica.
G. Goretti, A. Liberti, and B. M. Petronio.
Ann Chim 64(9/10), p 653-658, 1974.

Descriptors: *Pollutant identification, *Chromatography, *Organic compounds, Analytical techniques.
Identifiers: Thin layer chromatography.

Channel TLC may be used for the direct determination of hydrocarbons in waste water. By using silica gel TCL plates and a chloroform/benzene mixture(1:3)hydrocarbons are separated from fats and other organic compounds extractable in ether. From the length of the brown spot appearing after exposure to I vapors the hydrocarbon content is determined. By using a 0 2 ml sample the direct determination of hydrocarbon quantities up to 5 mg/l is carried out. Various analytical possibilities are discussed.
W77-01573

USE OF GAS CHROMOTOGRAPHY FOR STUDYING THE ACCUMULATION OF ORGANOCHLORINE PESTICIDES IN WATER AQUATIC ORGANISMS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
D. B. Girenko, M. A. Klisenko, and Yu. K. Pishcholka.
Gidrobiol Zh 11(3), p 69-72, 1975.

Descriptors: *Gas chromatography, *Pollutant identification, *Pesticide residues, *DDT, Fish, Crayfish, Perch, Pike, Organic pesticides, *Chlorinated hydrocarbon pesticides, Insecticides.
Identifiers: Anodonta, Bream, *Lindane, *Organochlorine pesticides, *Methoxychlor.

The gas chromatographic method proposed for studying the accumulation of chlorinated hydrocarbon pesticides (DDT, lindane, methoxychlor, etc.) in natural waters and aquatic organisms, particularly fish, is based on extraction of the sample with organic solvents, purification of the extract and determination of the pesticide on a chromatograph with an electron capture detector. The use of this sufficiently sensitive and selective gas chromatographic method of analyzing pesticide residues permits accomplishing, monitoring of the content of pesticide residues in water and aquatic organisms. (Anodonta, crayfish, pike-perch, pike and bream were included in the study.)--Copyright 1976, Biological Abstracts, Inc.
W77-01574

DETERMINATION OF ESTIMATED MAXIMUM PERMISSIBLE AND MAXIMUM RESIDUAL CONCENTRATIONS OF PESTICIDES IN ENVIRONMENTAL OBJECTS, BASED ON THE PRINCIPLES OF COMPLEX (INTEGRAL) STANDARDIZATION, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
For primary bibliographic entry see Field 5G.
W77-01575

METHOD OF DETERMINING THE TOTAL BIOCHEMICAL OXYGEN DEMAND OF SEWAGE WITH THE USE OF VARIOUS NITRIFICATION INHIBITORS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhincheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Moscow (USSR).
Y. Lur'e, and V. A. Odaryuk.
Gig Sanit 5, p 66-70, 1975.

Descriptors: *Biochemical oxygen demand, Sewage, Nitrification, Inhibition, *Nitrifying bacteria, Methodology, *Pollutant identification, Ureas.
Identifiers: *Thioureas.

The total biochemical O2 demand (BOD) of sewage and solutions of chemically pure substances can be determined with the nitrification inhibitors allylthiourea, thiourea and ethylene thiourea. These chemicals in a concentration of 0.5 mg/l inhibited nitrifying bacteria but did saprophytic microflora. Ethylene thiourea inhibited nitrification in all experiments until the end of the determinations (52 days) and is recommended for determining the total BOD of all sewage, especially when difficult to oxidize. The action period of allylthiourea and thiourea averaged 8-10 days; they are usable for readily oxidizable sewage. The method is simple and eliminates determination of ammonia, nitrites and nitrates.--Copyright 1976, Biological Abstracts, Inc.
W77-01579

PRACTICAL USE OF POLAROGRAPH MODELS PPT-1 AND OP-5122, (IN RUSSIAN),
M. G. Gavrilina, E. D. Dukhovnaya, E. N. Grekova, and M. F. Salikhdzhanova.
Gig Tr Prof Zabol 6, p 52-53, 1975.

Descriptors: *Lead, *Pollutant identification, *Polarographic analysis, Analytical techniques, Water pollution.

Oscillographic (OP-5122) and alternating-current (PP-1) polarographs with their high resolution can be used to determine Pb quickly and simply in metallurgical products, in biological media and in wastewaters from the microgram concentrations to whole fractions of a percent.
W77-01588

ISOLATED STRAINS OF ESCHERICHIA COLI FROM THE WATER SUPPLY AND RESIDUAL WATERS OF LARGE HOG FARMS, (IN FRENCH),
Institutul Agronomic din Timisoara (Rumania). Dept. of Nutrition and Animal Hygiene.
M. Decun, V. Tomescu, and E. Crainiceanu.
Institutul Agronomic din Timisoara). Dept. of Nutrition and Animal Hygiene.

Descriptors: *E. coli, Water supply, *Farm wastes, Water sampling, Treatment facilities, Isolation, Bacteria, Bacteriology, Epidemiology, *Pollutant identification, Hogs.
Identifiers: Eipzootiology.

By bacteriological examination of 121 water samples from wells, water supply installations and sewage purification plants, 523 strains of E.coli were isolated. Their biochemical and serological typing revealed 66 cultures belonging to 28 serogroups some of which are potentially pathogenic for animals and man. The study of hemolytic and enterotoxic properties, their viability and variability in water, their resistance to antibiotics and chemotherapeutics and the evalustion of their epidemiologic and epizootologic implications suggest a causative chain: animal-water-man.
W77-01589

ASSESSMENT OF CADMIUM IN FISHES FROM CARINTHIAN LAKES, (IN GERMAN),
M. Weiser, A. Lottermoser, H. Weingarten, and W. E. Krocza.
Wien Tieraerztl Monatsschr 62(6-8), p 214-217, 1975.

Descriptors: *Cadmium, Absorption, Fish, Lakes, *Flame photometry, Pike, Perch, Carp, Pollutant identification, Brook trout.
Identifiers: *Carinthian Lakes.

Cd concentrations were assessed in the back muscles of fish from Carinthian lakes using atomic absorption flame photometry. Thirteen species (95 specimens) were used in the study: pike, chub, perch, rudd, roach, undermouth, tench, barbel, bream, brook trout, white bream, Bavarian roach and carp. The arithmetic mean Cd concentrations within the total population was about 39 ppb. Cd intake by consumption of fish from the Carinthian lakes covered by this study is far below the temporary acceptable weekly intake of 400-500 ug Cd established by the WHO.--Copyright 1976, Biological Abstracts, Inc.
W77-01593

PHOTOMETRIC DETERMINATION OF ISOPRENE AND NEOZONE D IN WATER, (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow. Institut Biofiziki.
Z. A. Krotova.
Gig Sanit 4, p 61-63, 1975.

Descriptors: *Pollutant identification, *Photometry, *Organic compounds, Analytical techniques.
Identifiers: *Isoprene, *Neozone D.

A photometric method of determining isoprene and the rubber antioxidant Neozone D in water, based on their interaction with diazotized solution of p-nitroaniline, was developed. By this method it is possible to analyze waters containing isoprene at the maximum permissible level for water bodies (0.005 mg/1) and Neozone D in aconcentration of 0.004 mg/1. The relative error of determining isoprene is 12% and Neozone D 20%.
W77-01594

METEOROLOGICAL FACTORS AND AIR POLLUTION IN SOFIA, (IN RUSSIAN),
Academy of Medicine, Sofia (Bulgaria). Center for Hygiene.
I. Kalpazanov, and G. Kurchatova.
Gig Sanit 5, p 83-84, 1975.

Descriptors: *Meteorology, *Air pollution, Regression analysis, *Oxides, *Sulfides, Europe, Nitrogen.
Identifiers: *Sofia(Bulgaria).

The results of daily chemical determinations of the air in Sofia, Bulgaria, were compared with atmospheric pressure, cloud cover, visibility, air temperature, relative humidity and wind speed. Multiple correlation coefficients were determined by regression equations. Meteorological factors play a role in pollution by removal of nitrogen oxides, oxidants, formaldehyde and hydrogen sulfide in the air of Sofia.
W77-01601

SIGNIFICANCE OF SUSPENDED LOAD AND BOTTOM DEPOSITS IN SELF-PURIFICATION OF THE SELENGA RIVER FROM PETROLEUM PRODUCTS, (IN RUSSIAN),
Limnologicheskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 5G.

W77-01606

THIN-LAYER CHROMATOGRAPHIC TECHNIQUE FOR IDENTIFICATION OF WATERBORNE PETROLEUM OILS,
Coast Guard Research and Development Center, Groton, Conn.
W. A. Saner, and G. E. Fitzgerald, II.
Environmental Science and Technology, Vol. 10, No. 9, p 893-897, September 1976. 6 fig, 4 tab, 7 ref.

Descriptors: *Pollutant identification, *Oil spills, *Oil pollution, *Chemical analysis, *Analytical techniques, *Chromatography, Chemistry, Water pollution sources, Instrumentation, Fuels, Gasoline, Oil wastes, Organic matter, Water pollution, Fluorescence, Evaluation, Aromatic compounds, Methodology.
Identifiers: *Waterborne petroleum oils, *Thin-layer chromatographic technique, Polar compounds, Iodine staining, Diesel fuels, Ship bilge oil, Kerosine.

A thin-layer chromatographic procedure for the identification of water-borne petroleum oil pollutants for use in either the laboratory or the field was developed. Aromatic and polar compounds were removed from the oil sample by a liquid-liquid extraction with acidified methanol. The extract was then chromatographed on a silica-gel, thin-layer plate. Separated components were detected by their fluorescence under long and short wave ultraviolet light. Iodine staining was also used to visualize unsaturated, nonfluorescing compounds. The procedure was successfully applied to 'fingerprinting' gasolines, kerosines, diesel oils, heavy fuel oils, lubricating oils, and ship bilge oils. (Henley-ISWS)
W77-01631

PETROLEUM ANALYSIS: METHODOLOGY FOR QUANTITATIVE AND QUALITATIVE ASSESSMENT OF OIL SPILL,
National Bureau of Standards, Washington D.C. Bioorganic Standards Section; and National Bureau of Standards, Washington D.C. Trace Organic Analysis Group; and National Bureau of Standards, Washington Chemistry Div.
H. S. Hertz, W. E. May, S. N. Chesler, and B. H. Gump.
Environmental Science and Technology, Vol. 10, No. 9, p 900-903, September 1976. 3 fig, 2 tab, 5 ref.

Descriptors: *Pollutant identification, Oil, *Oil spills, *Oil pollution, *Chemical analysis, *Analytical techniques, *Water pollution sources, Oil wastes, Gas chromatography, Mass spectrometry, Chemistry, Instrumentation, Fuels, Organic matter, Chromatography, Marine biology, Marine animals, Equations, *Methodology.
Identifiers: *Oil analysis, Marine environment, Chromatographic methods, Organic extractions, Headspace technique, Marine organisms, Dynamic headspace sampling, Oil spill assessment, Oil-water emulsion, Petroleum compounds.

An integrated chromatographic technique for petroleum analysis compatible with long-term studies of oil spills was presented. Dynamic headspace sampling and the complementary analytical techniques of gas chromatography and coupled-column liquid chromatography were utilized for quantitation of petroleum-containing samples. Gas chromatography-mass spectrometry was employed for identification of individual components in these samples. Analytical data obtained from a major oil spill were presented and discussed. (Henley-ISWS)
W77-01632

DETERMINING THE SOURCE OF NITRATE IN GROUND WATER BY NITROGEN ISOTOPE STUDIES,
Texas Univ. at Austin. Bureau of Economic Geology.
C. W. Kreitler.
Report of Investigations No. 83, 1975. 62 p, 25 fig, 23 tab, 109 ref, 6 append.

Descriptors: *Pollutant identification, *New York, *Texas, *Missouri, *Nitrates, *Isotope studies, *Nitrogen compounds, *Groundwater, *Nitrogen cycle, Analytical techniques, Inorganic compounds, Chemical wastes, Fertilizers, Leaching, Nitrites, Water pollution sources, Ammonia, Ureas, Chemicals, Nitrification.
Identifiers: *Nitrogen isotope studies, Isotopic ratios, *Groundwater nitrate studies, *Runnels County(Tex), Specific ion electrode, Nitrate ions, Ammonium ions, Chemical fertilizers, Barnyard wastes.

Because of potential health problems, the extent of nitrate contamination and the major nitrate contributors to a water supply should be known. Nitrate concentrations above 1 or 2 mg/l are in the groundwaters in many of the geographic areas of Texas with the highest percentage values in West-Central and North-Central Texas. The highest average nitrate concentration in Texas was found in Runnels County. Analysis revealed the following conditions: There are two isotopic ranges of soil nitrate in the soils of southern Runnels County. Nitrate from the decomposition of animal waste nitrogen has a del N15 (delta N15) of +10 ppt to +22 ppt. The isotopic ratio is controlled by the volatilization of isotopically light ammonia gas during the decomposition of urea in urine. Nitrate derived from the mineralization of organic nitrogen in cultivated soils has a del N15 of +2 ppt to +8 ppt. In southern Runnels County, the major source of nitrate in groundwater is natural soil nitrate. The isotopic composition of groundwater nitrate beneath cultivated fields corresponds with del N15 of natural soil nitrate. Groundwaters beneath farmhouse-barnyard complexes have a higher average del N15, indicating the addition of animal waste nitrate. Eleven samples of groundwater from Macon County, Missouri, have del N15 of +10 ppt to +19 ppt, indicating that the waters are contaminated with nitrate from animal wastes. Nitrates in groundwaters from the Upper Glacial aquifer in Queens County, New York, appear to be from an animal waste source, whereas nitrates in groundwaters from the Magothy aquifer in Nassau County, New York, appear to be from either natural soil nitrogen or artificial fertilizer. (Henley-ISWS)
W77-01636

PERFORMANCE CHARACTERISTICS FOR THE SPECTROPHOTOMETRIC DETERMINATION OF TOTAL IRON IN FRESHWATER USING HYDROCHLORIC ACID,
Freshwater Biological Association, Windermere (England).
W. Davison, and E. Rigg.
The Analyst, Vol. 101, No. 1205, p 634-638, August, 1976. 12 ref, 2 tab.

Descriptors: Freshwater, *Water analysis, *Iron, *Pollutant identification, *Spectrophotometry, *Analytical techniques, Copper, Water pollution sources, Metals, Iron compounds, Water, Trace elements, Water chemistry, Water properties, Heavy metals.

A method is described for the determination of total Fe in freshwater, using a wet-oxidation procedure followed by spectrophotometric measurement in 5.93 + or - 0.07 M HC1. It has been used successfully in routine analyses for several years and requires only standard equipment and inexpensive reagents. The limit of detection is 0.009 mg/liter for the 95% confidence level. The relative standard deviation at 0.2 mg/liter is 4.4% and at 3 mg/liter is 1.5% for 19 degrees of freedom. Comprehensive interference tests show that the method is adequately selective for use with freshwater. Copper is the only substance to interfere significantly, but below 0.1 mg/liter it has a negligible effect. (Witt-IPC)
W77-01642

AN AUTOMATED METHOD FOR THE DETERMINATION OF LOW-LEVEL KJELDAHL NITROGEN IN WATER AND WASTE WATER,
Canada Centre for Inland Waters, Burlington (Ontario).
O. Elkei.
Analytica Chimica Acta, Vol. 86, p 63-68, October, 1976. 2 fig, 10 ref, 2 tab.

Descriptors: *Pollutant identification, *Water analysis, *Nitrogen compounds, *Colorimetry, Analytical techniques, Ammonia, Digestion, Water pollution sources, Water properties, Trace elements, Automation, Chemical analysis.

An automated system for low-level Kjeldahl nitrogen determinations in water samples is described. Samples are continuously digested at 300 C with sulfuric acid and hydrogen peroxide to convert the organic nitrogen to ammonia, which is determined colorimetrically with sodium salicylate and sodium dichloroisocyanurate (as chlorine source). The method has a range of 10-500 micrograms N/liter with good precision and accuracy. (Witt-IPC)
W77-01643

INVESTIGATION OF THE PROBLEM OF DETERMINING TOTAL SUSPENDED SOLIDS IN PULP AND PAPER EFFLUENTS,
ITT Rayonier Inc., Shelton, Wash.
D. R. Kendall.
Tappi, Vol. 59, No. 9, p 75-78, September, 1976. 4 tab.

Descriptors: *Suspended solids, *Pulp wastes, *Centrifugation, *Filtration, Wastes, Industrial wastes, Water pollution sources, Turbidity, Filters, Analytical techniques, Effluents, Analysis, Pollutant identification.

Five techniques of determining total suspended solids in pulp and paper mill effluent were investigated for the purpose of finding a method which would (1) include turbidity-producing, finely divided, biological solids; (2) be practical for use as routine monitoring tool; and (3) form the basis for obtaining data to generate effluent guidelines that relate to the Environmental Protection Agency definition of total suspended solids. A technique utilizing centrifugation followed by filtration of the entire sample through a 2.4-cm diameter fiber glass disk situated in a porous-bottom crubicle has produced the most promising results. This technique gave results which were consistent and independent of sample volume, inclusive of turbidity-producing solids, and obtainable within a reasonable analysis time. The technique is capable of handling problem effluents containing difficult-to-filter, amorphous biological solids. (Sykes-IPC)
W77-01652

ANNUAL BOOK OF ASTM STANDARDS. PART 31: WATER,
American Society for Testing and Materials, Philadelphia, Pa. 1976. 956 p.

Descriptors: *Water analysis, *Standards, *Analytical techniques, *Specifications, *Testing procedures, Sampling, Flow measurement, Physical properties, Hydrogen ion concentration, Conductivity, Corrosion, Odor, Hardness(Water), Specific gravity, Surface tension, Turbidity, Suspended solids, Toxicity, Inorganic compounds, Organic compounds, Heavy metals, Dissolved oxygen, Phosphorus, Silica, Phenols, Radioactivity, Radioisotopes, Bacteria, Bioassay,

Water treatment, *Pollutant identification, *Water quality standards.

The standards included in this volume are those developed by ASTM Committee D-19 on definitions, specifications, reagents, and test procedures pertaining to water; sampling and flow measurements; general (physical) properties of water (pH, conductivity, corrosivity, odor, hardness, specific gravity, surface tension, turbidity, particulates, toxicity); analysis for inorganic and organic constituents (heavy metals, dissolved oxygen, phosphorus, silica, phenolic compounds, etc.); radioactivity (radionuclides, heavy water); bacteriological bioassay; water-formed deposits; and water-treatment materials, such as ion-exchangers. (Brown-IPC)
W77-01662

PHENOLIC AND CHLOROPHENOLIC OLIGOMERS IN CHLORINATED PINE KRAFT PULP AND IN BLEACH PLANT EFFLUENTS,
State Univ. of New York at Syracuse. Empire State Paper Research Inst.
For primary bibliographic entry see Field 5B.
W77-01669

A STUDY TO DEFINE CHANGES IN PULP MILL EFFLUENT-CONTRIBUTED COLOR IN RECEIVING WATERS DETECTABLE BY HUMAN OBSERVERS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
R. C. Whittemore, and J. J. McKeown.
NCASI Stream Improvement Technical Bulletin, No. 283, 160 p, December, 1975. 18 fig, 125 ref, 100 tab.

Descriptors: *Pulp wastes, Natural streams, *Color, Colorimetry, Effluents, Water pollution sources, Wastes, Industrial wastes, *Water pollution, Water pollution effects, Water properties, Water quality, Streams, *Pollutant identification, Light.
Identifiers: *Kraft mills, *Subjective evaluation, Color perception, Illumination, Perception thresholds.

The ability of human observers to detect changes in the color of natural waters due to kraft mill effluents was studied. Factors affecting the perception of color changes included the baseline color, illumination intensity, the direction of color change, and the sensitivity and color memory of the observer. In general, increases of 20 and 40 color units in the field were perceived by 50 and 90% of the observers, respectively. The ability to detect decreasing changes was somewhat less. Subjects for further research are discussed. (Buchanan-IPC)
W77-01677

COMPARATIVE STUDIES ON THE ISOLATION OF SALMONELLA FROM EFFLUENTS, (IN RUSSIAN),
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Lab. for Zoonoses.
E. H. Kampelmacher, Jansen Van Noorle, and M. Lucretia.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. 157(1), p 71-77, 1973.

Descriptors: *Salmonella, *Sewage effluents, *Sewage, *Sewage bacteria, *Isolation, Waste water(Pollution), *Enteric bacteria, Separation techniques, Epidemiology, Bacteria, Pollutant identification.
Identifiers: Enterobacteriaceae, Netherlands, Walcheren.

In connection with epidemiological studies on Salmonella cycles in nature, the effluents from 14 sewage treatment plants on the island of Walcheren (Netherlands) were examined over a 6-mo. period. The frequent occurrence of Salmonella, with homogeneous distribution of many bacteria, including a large number of Enterobacteriaceae, made the material particularly suitable for comparative studies of isolation methods of Salmonella from effluents. A description of these methods and the results obtained is given.--Copyright 1974, Biological Abstracts, Inc.
W77-01691

WATER POLLUTION MONITOR,
Process and Pollution Controls Co., Tulsa, Okla. (Assignee).
U. Cirulis, and E. M. Zacharias, Jr.
U.S. Patent No. 3,973,430, 18 p, 13 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 949, No 2, p 489, August 10, 1976.

Descriptors: *Patents, *Oil pollution, *Water pollution control, *Water quality control, *Monitoring, *Measurement, Water pollution sources, Control systems, Acoustics, Sound waves, *Pollutant identification.
Identifiers: Ballast, Tankers, Refinery effluents.

The invention relates to a system and a method of determining the concentration of oil, other petroleum products or hydrocarbons in water. It is used in the measurement of the concentration of oil contained in the ballast liquid carried by tankers and in the measurement of the concentration of petroleum products in the effluent from refineries. The system for comparing the sound velocity characteristics of the contents of the tank being discharged with the sound velocity characteristics of the water being discharged from the same tank is accomplished by dividing a portion of the flow from the tank into a standard and an unknown. The standard is obtained by removing the suspended and undissolved solids and hydrocarbons from the water by mechanical means. This leaves the water principally containing dissolved components as the standard. Both the standard and the unknown sample are run through a common high temperature bath so that they are both at the same temperature, near the point at which the slope of the sound velocity temperature curve is close to zero. The sound velocity in the standard is measured by a sound velocimeter, using a single transducer and a reflector having an acoustic impedance different from that of the water. The sound velocity in the sample is measured by a sound velocimeter which is as identical as possible to the velocimeter measuring the sound velocity in the standard. The received signals are compared to obtain a difference frequency, which is converted to an analog voltage which is proportional to the difference in sound velocity and thus to the concentration of the hydrocarbons in the water. (Sinha-OEIS)
W77-01722

MONITORING GROUND-WATER QUALITY: METHODS AND COSTS,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01771

MONITORING GROUNDWATER QUALITY: ILLUSTRATIVE EXAMPLES.
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01772

MONITORING GROUNDWATER QUALITY: DATA MANAGEMENT,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01773

MONITORING GROUNDWATER QUALITY: MONITORING METHODOLOGY,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01775

PROCEEDINGS OF THE FIRST MICROBIOLOGY SEMINAR ON STANDARDIZATION OF METHODS, JANUARY 9-11, 1973, SAN FRANCISCO, CALIFORNIA.
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 134, Price codes: A10 in paper copy, A01 in microfiche. EPA Report No. EPA-R4-73-022, March 1973. S. S. Verner, editor. 216 p. 6 fig., 19 tab., 204 ref. 1H1327

Descriptors: *Microbiology, *Standards, *Analytical techniques, *Pollutant identification, *Laboratory tests, *Methodology, Bioindicators, Coliforms, *Sampling, Federal Water Pollution Control Act, Legal aspects, Pathogenic bacteria, Viruses, Bacteria, Enteric bacteria, E. Coli, Sewage bacteria, Fungi, Pathogenic fungi, *Water quality standards, *Bioassay.

The presentations centered on the efforts of the Environmental Protection Agency to standardize national sampling methods and laboratory tests in identifying microbiological pollutants and pollution indicators in potable water, recreational waters, marine and estuarine waters. Peripheral subjects cover the role of the microbiologist as a witness in court proceedings related to enforcement of the Federal Water Pollution Control Amendments of 1972, and the investigations conducted in the microbiological sphere by the EPA Office of Research and Monitoring. Other contributions detail the methodology in identifying and laboratory testing of coliforms, fecal coliforms, fecal streptococci and their applicability in water quality measurement; discussed also are virus detection and zoomicrobes as pollution indicators. Discussions of the methodology for enumerating Pseudomonas aeruginosa, fungi and the role of fungi as a pollution indicator, identification and detection of Salmonella, and the impact of microbial seeding for oil spill degradation follow. Sample collection precedures in water and sediments, the survival of bacterial samples, sampling devices used in sediments and water, and quality control in laboratory testing concluded the seminar. Discussions follow each presentation. (Auen-Wisconsin).
W77-01781

PROGRAM FOR PREVENTING AND ELIMINATING OIL POLLUTION OF THE BUFFALO RIVER,
Calspan Corp., Buffalo, N. Y.
R. C. Ziegler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 518, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-029, February 1976. 134 p. 56 fig., 3 tab., 17 ref. 11020 DJG. WPRD 263-01-68.

Descriptors: *Oil pollution, *Water pollution treatment, Technology, Rivers, Barriers, Sampling, Telemetry, Sewers, Obstruction to flow, Costs, Emulsions, *New York, Flotsam, Skimming, Siphons, Surfactants, Remote sensing, *Indicators, *Pollutant identification.
Identifiers: *Buffalo River(NY), Sensors, Pneumatic barriers.

Details are given of equipment and techniques developed to alleviate oil pollution in an industrial watercourse, such as the Buffalo River, New York. Surface oils can be effectively restrained by combinations of pneumatic barriers in low flowing currents. Surface-active piston films direct oil

films from confined areas, condense, thicken and guide their motion; they are also useful for preventing shoreline impaction of wind-driven slicks and for improving the operating efficiencies of skimmers. The best design for skimming oil slicks is a suction type skimmer head followed by an oil-from-water separation system, and a separate debris retrieval lift operated from a boat. For detecting oil in sewers, a device based on the ultra-violet transmission characteristics of oil is capable of sensing oil dispersed over the range of 5 to 10,000 ppm or oil films ranging in thickness from a few microns to about 1 millimeter. Also developed were radio frequency and heat conductivity sensors which can detect massive oil accumulations from a few millimeters to several meters thick. The sensors are compatible with narrow-based, low-duty-cycle telemetry which permits central readouts. The best technique to identify and sample oils is chloroform extraction in conjunction with around-the-clock monitoring. The inverted siphon sanitary sewer design is nearly 100% effective for trapping domestic and industrial surface oils but it has almost zero efficiency for trapping emulsified oils. (Auen-Wisconsin).
W77-01782

SUBTIDAL CONCRETE PILING FAUNA IN MONTEREY HARBOR, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
W. Donat.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-016 573, Price codes: A05 in paper copy, A01 in microfiche. Master's thesis, September 1975. 83 p. 18 fig., 4 tab., 19 ref.

Descriptors: *Marine animals, *Marine algae, *Fouling, *Concrete piles, *California, Varieties, Biomass, Water pollution, *Pollutant identification.
Identifiers: *Monterey harbor(Calif).

Fouling organisms were collected and identified from a wharf concrete piling in Monterey Harbor, California. Collections were made over the piling's length from the lowest part of the intertidal zone to the bottom 7.1 m below zero tide level. The piling was dominated by Metridium senile and dense colonies of Phoronis vancouverensis at intermediate depths, with Phyllochaetopterus prolifica occupying the shallow depths. Species of Protozoa, Porifera, Coelenterata, Platyhelminthes, Nemertea, Sipuncula, Annelida, Arthropoda, Mollusca, Bryozoa, Phoronida, Echinodermata, and Cherdata as well as the algae Phaeophyta and Rhodophyta are tabulated as to size, depth distribution and abundance. Species are identified to phyla and drawings illustrate the more prominent animals. (Auen-Wisconsin)
W77-01783

NATIONAL EUTROPHICATION SURVEY METHODS 1973-1976.
National Environmental Research Center, Las Vegas, Nev. Monitoring Applications Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 886, Price codes: A05 in paper copy, A01 in microfiche. Working Paper No. 175, June 1975. 94 p. 4 tab., 12 ref., 6 append. 1BA029.

Descriptors: *Eutrophication, *Surveys, *Sampling, *Data collections, Statistical methods, Testing procedures, Investigations, Analytical techniques, Lakes, Streamflow, Drainage area, Nutrients, Tributaries, Outlets, Sewage effluents, Septic tanks, Precipitation(Atmospheric), Algae, Bioassay, Quality control, Runoff, Laboratory tests.
Identifiers: *Nutrient sources, *Nutrient loads.

Field investigative procedures of the Environmental Protection Agency National Eutrophication Survey, as used in the last three years of their study in selected freshwater lakes, are comprehensively described. Included are details of field sampling methods for lakes and reservoirs, streams and municipal sewage treatment plants; analytical methods; nutrient analyses; Geological Survey estimates of stream flows and drainage areas; and estimates of nutrient loadings from tributaries and outlets, municipal wastewater treatment plants, septic tanks and precipitation. Also described are algal assays, algal identification and enumeration methods and various quality control and field techniques utilized by the laboratories which participated in the study. (Harris-Wisconsin)
W77-01787

NATIONAL EUTROPHICATION SURVEY: DATA ACQUISITION AND LABORATORY ANALYSIS SYSTEM FOR LAKE SAMPLES,
Environmental Monitoring and Support Lab., Las Vegas, Nev.
J. W. Mullins, R. N. Snelling, D. D. Moden, and R. G. Seals.
Report No. EPA-600/4-75-015, November 1975. 26 p. 10 fig., 3 append. 1BA029.

Descriptors: *Sampling, *Eutrophication, *Surveys, *Data collections, Testing procedures, Investigations, Analytical techniques, Water analysis, Laboratory tests, Quality control, Chemical analysis, Phosphorus, Nitrogen, Laboratory equipment.
Identifiers: *Autoanalyzer, STORET computer system.

Elements of the system utilized for data acquisition and laboratory analysis for the Environmental Protection Agency National Eutrophication Survey in their study of eutrophication in selected freshwater lakes, are comprehensively described. Details are provided for field measurement and data recording, station description codings, sample controls, laboratory analysis and data management via the STORET system. Appendices include sample data forms, a detailed description for analyzing nitrogen and phosphorus with the Technicon Triple Channel AAII Autoanalyzer and storet parameter codes. (Harris-Wisconsin)
W77-01788

RELATIONSHIPS BETWEEN ZOOPLANKTON DISPLACEMENT VOLUME, WET WEIGHT, DRY WEIGHT, AND CARBON,
Woods Hole Oceanographic Institution, Mass.
P. H. Wiebe, S. Boyd, and J. L. Cox.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-022 723, Price codes: A02 in paper copy, A01 in microfiche. Fishery Bulletin, Vol. 73, No. 4, p. 777-786, 1975. 5 fig., 4 tab., 19 ref. NR 083-004. N00014-66-C-0241; NSF GA-29303.

Descriptors: *Zooplankton, *Biomass, *Measurement, Correlation analysis, Weight, Carbon, *Pollutant identification.
Identifiers: Wet weight, Dry weight.

Interconversion of various measures of zooplankton biomass have considerable utility in studies requiring nondestructive techniques or for interpretation of past data. In establishing predictive relationships between such measures, the appropriate regression to use is the geometric mean estimate, which provides a regression line where the regression of X on Y and Y on X are identical. Using both data derived from samples collected from diverse oceanic areas and from literature this type of analysis was employed in determining that statistically significant relationships exist between carbon, wet weight, displacement volume, and dry weight when a constant technique is used. The slope of the regression line for log transformed values for carbon vs. dry weight and wet weight vs. displacement volume was sufficiently close to unity to assume a straight percentage conversion between these values. Carbon was 31-33% of dry weight and wet weight was 72-73% of displacement volume. Comparability of different techniques for a biomass measurement may be poor, especially in displacement volume and wet weight measurements due to variations in the interstitial water content. Moreover, interstitial water content varies inversely with total biomass density which accounts for the absence of a simple percentage relationship between wet weight and displacement volume and other measures of zooplankton biomass. (Auen-Wisconsin)
W77-01790

BIOLOGICAL INVESTIGATIONS OF TUTTLE CREEK RESERVOIR, KANSAS,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Field Investigations Branch.
For primary bibliographic entry see Field 5C.
W77-01794

SUSPENDED SEDIMENT DETERMINATION IN ESTUARINE WATERS FROM PHOTOMETER AND SECCHI DISC MEASUREMENTS,
Naval Academy, Annapolis, Md.
J. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-018 278, Price codes: A02 in paper copy, A01 in microfiche. Report USNA-EPRD-16, September 1975. 12 p. 1 tab., 5 ref.

Descriptors: *Analytical techniques, *Turbidity, *Suspended load, *Photometry, *Secchi disks, Estuaries, Measurement, Chesapeake Bay, On-site data collections, Surface waters, Suspended solids, *Pollutant identification.

To arrive at quantitative expressions of transmitted light, reflected light, and absorbed light as affected by suspended solids, a water body is divided into a large number of very thin 'plates.' Each plate has a unit cross-sectional area but is limited in its thickness so that no particle shades any other within a single plate. By relating the transmitted, reflected, and absorbed light for each plate to the suspended particles, mathematical expressions may be derived by stacking a large number of plates and summing the cumulative effect of the relationship between particle size and concentration and the optical parameters of relative irradiance and beam transmittance. By including the effects of multiple scattering, the portion of light scattered in a backward direction is calculated and turbidity parameters are consequently related to the relative irradiance loss coefficient and the attenuation coefficient. These are directly obtainable from photometer and Secchi disc measurements. The method is suitable to any situation where a single type of suspensoid material predominates, such as in areas of high erosion or active dredging. Because of the in situ nature of the measurements and the fact that single determinations of this type have a built in volume averaging property, this method has potential for wider applications. (Auen-Wisconsin)
W77-01795

1975 ANNUAL REPORT OF THE FRESHWATER BIOLOGICAL INVESTIGATION UNIT.
Northern Ireland Dept. of Agricultural, Antrim.
For primary bibliographic entry see Field 5C.
W77-01804

THE DEMONSTRATION AND STANDARDIZATION OF A METHOD FOR MONITORING THE ECOLOGICAL EFFECTS OF MARINE WASTE DISCHARGES.
Biome Co., Inc., Surfside, Calif.
California State Water Resources Control Board Publication No. 54, April 1974. 96 p., 23 fig., 4 tab., 79 ref., 1 append.

Descriptors: *Monitoring, *Biota, *Outfall sewers, *Dispersion, *Bioassay, Sewage effluents, Standing crops, Oceans, California, Buoys, Coasts, Productivity, Biological communi-

ties, Chlorinated hydrocarbon pesticides, Heavy metals, Testing procedures, *Pollutant identification, Path of pollutants.

An improved method for monitoring the effects of sewage outfalls and dispersion of effluents off the California coast consists of simple and inexpensive line buoys which permit exposure of ceramic panel substrates in ocean depths down to at least 200 feet. The substrates are nonpigmented ceramic panels 10 cm x 10 cm x 3/8 in. A 6- to 12-ft vertical interval was required to delineate the dispersion area during periods of complex stratification. Four sets of buoy stations were deployed in the Pacific Ocean for 92-day periods, approximately 4.5 miles offshore at the terminus of the Orange County Sanitation District's Ocean Outfall No. 2. Parameters derived from the biomass analysis included gross productivity, the absolute and relative frequences of some species and species groups, the relative chlorinated hydrocarbon levels, and the relative heavy metal levels. Productivity was equivalent to the biomass of the common hydroid, Obelia dichtoma. Gross productivity was inhibited in the waste dispersion field. Buoy station losses were 50% to 60% thus the number of stations deployed should compensate for losses. The float costs ranged between $30.00 for the largest to $20.00 for the smallest. The data from an adequate array of stations should make it possible to plot the mean position of the waste dispersion field. (Auen-Wisconsin)
W77-01806

INVESTIGATION OF LASER RAMAN SPECTROSCOPY FOR ANALYSIS OF WATER QUALITY,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
F. G. Ullman.
Nebraska Water Resources Research Institute, Lincoln, Completion Report, June 1976. 21 p, 4 fig, 5 ref. OWRT A-035-NEB (1). 14-34-0001-6029.

Descriptors: Water quality, Pollutants, *Herbicides, *Pollutant identification, Water analysis, *Analytical techniques, *Nitrates, *Sulfates, *Spectroscopy, Ion exchange, Pesticide residues.
Identifiers: *Laser Raman spectroscopy, Atrazine, Picloram, Trifluoralin, Amiben, Dicamba.

Laser Raman spectroscopy was studied as a tool for analysis of water quality. Lower limits for the detection of nitrates and sulfates in distilled water were determined to be 20 ppm and 8.5 ppm respectively. The herbicides atrazine, picloram, trifluoralin, amiben and dicamba (primarily in methano solutions as the solubility of most of these in water is very low) were also investigated. Atrazine could be detected down to 750 ppm (as atrazine). Trifluoralin absorbed most of the incident light at the two test laser frequencies so a spectrum could not be obtained and the spectra of the other herbicides were obscured by their own fluorescence. At the lower limit of detectability of nitrate and sulfate ions, the impurity signal is obscured by a 'background' signal that can be as large as a few orders of magnitude above the intrinsic background of the instrument. These 'background' signals are reported in the literature to be characteristic of liquid solvents. This unavoidable background forces a lower limit on the utilization of Raman spectroscopy for studying impurities in unconcentrated water samples. Further studies were made on concentrated samples, prepared by reversible ion exchange using an ion exchange resin. Concentration by this method appears feasible. However, the reproducibility of removal and recovery of the desired ion has not been completely established. The relative merits of this technique for studies of water quality are discussed.
W77-01817

NITRATE AND PHOSPHATE: TIME-TREND CONCENTRATIONS IN SELECTED KANSAS STREAMS,
Kansas Water Resources Research Inst. Manhattan.
For primary bibliographic entry see Field 5B.
W77-01818

TRACE METAL DETECTION IN AQUATIC ENVIRONMENTS BY ACTIVATION ANALYSIS OF NAIAD SHELLS,
Ohio State Univ., Columbus. Dept. of Zoology.
W. E. Carey.
Ohio Water Resources Center, Columbus, Completion Report 442X, July 1976. 46 p, 26 fig, 6 tab, 15 ref. OWRT A-028-OHIO (1).

Descriptors: *Metals, *Neutron activation analysis, Mollusks, Radioisotopes, Calcium, Strontium, Sodium, Manganese.
Identifiers: Biological monitors, Species effect, Age effect.

This study investigated the feasibility of using neutron activation analysis of aquatic mollusk shells to measure quantities of trace metals in water. A generalized approach to estimating the sensitivity of a particular metal/irradiation facility/assay system was developed. Radiation hazard to both activation analysts and subsequent users of irradiated museum specimens was investigated and found to be minimal. A sample preparation technique was developed to separate annual shell layers. Three species of naiads (Quadrula q. quadrula, Amblema p. plicata, and Pontamilus alatus) were used to determine that there is no significant species effect on the concentration in the shell of the four elements investigated (calcium, manganese, strontium, and sodium). Similarly, there was no significant variation in concentration with the sex of the collected individual. The age of the collected individual did affect the concentration in the shell of both manganese and sodium, but had no significant effect on calcium or strontium concentration. Finally, a boat was designed and assembled for the specific purpose of collecting naiads from a river system. The equipment is described in some detail.
W77-01820

ON-LINE SURVEILLANCE OF INDUSTRIAL EFFLUENTS EMPLOYING CHEMICAL-PHYSICAL METHODS OF FISH AS SENSORS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
W. P. Bonner, and E. L. Morgan.
Research Report No. 51, August 30, 1976. 64 p, 5 fig, 13 tab, 30 ref, 2 append. OWRT B-030-TENN. (1). 14-31-0001-4160.

Descriptors: *Monitoring, Measurement, *Industrial wastes, Water pollution control, *Toxicity, *Bioindicators, *Pollutant identification, *Respiration, Fish physiology, *Tennessee, River basins.
Identifiers: *Duck River basin(Tenn), Biological monitoring system.

A physiological response of fish, namely, breathing rate, was used to monitor an industrial effluent to detect toxic concentrations of pollutants. Remote sensing devices and associated electronic equipment detected the breathing rate and provided an electrical signal to alert plant personnel of possible discharge problems. During the test period the plant effluent failed to cause an alert; however, mock spills provided an alert as predicted. Parameters tested were flow, temperature, pH, salinity, hydrofluric acid, phenol, calcium fluoride, and phossy water (water that has come in direct contact with large quantities of molten phosphorus). Chemical physical monitors were used to determine the source of those pollutants which are easily monitored. Both monitoring systems have their advantages and disadvantages; however, when used together they can be a useful tool in providing an early warning of toxic conditions and a useful tool in the management of water resources.
W77-01823

IDENTIFICATION OF MAJOR PROCESSES IN BIOTRANSFORMATIONS OF PETROLEUM HYDROCARBONS AND TRACE METALS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01870

EVALUATION STRATEGIES OF METAL POLLUTION IN OCEANS,
University of Southern California, Los Angeles. Environmental Engineering Program.
K. Y. Chen, and R. A. Lockwood.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE2, p 347-359, Proceedings paper No. 12023, April 1976. 2 fig, 5 tab, 10 ref.

Descriptors: *Bioassay, *Dissolved solids, *Environmental engineering, *Sediments, *Surface runoff, *Trace elements, Coastal engineering, Waste water(Pollution), *Metals.
Identifiers: Settling, Elutriation, Solids, Ocean environments, Marine engineering.

The ecological significance of metal inputs into the ocean from different sources are evaluated with six parameters in addition to the conventional analysis of total concentration and mass emission rate from a waste stream. The parametric approaches include: (1) the association of heavy metals with settleable solids--partition between solid and solution phase; (2) settling characteristics of solids in waste streams and their effects on the subsequent distribution of metal species; (3) correlation of metal contents in different size fractions of particles with metals enrichment in the proximity of the discharge area; (4) chemical elutriation in relation to bioavailability; (5) effects of mixing, dispersion, and settling of suspended particulates on the release of trace metals; and (6) bioassay and chemical analysis to determine the toxicities and food chain enrichment potentials of particulate waste stream or elutriates or of specific solid chemical species. (Bell-Cornell)
W77-01875

CHEMICAL AND BIOLOGICAL QUALITY OF WATER IN PART OF THE EVERGLADES, SOUTHEASTERN FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W77-02013

AN EVALUATION OF METHODS FOR MEASURING ALGAL GROWTH,
Geological Survey, Doraville, Ga.
W. T. Shoaf, and B. W. Lium.
Journal of Research of the U S Geological Survey, Vol 4, No 4, p 497-504, July-August 1976. 9 fig, 3 tab, 7 ref.

Descriptors: *Algae, *Growth rates, *Analytical techniques, *Plant growth, *Bioassay, Surface waters, Cultures, Biological properties, Biomass, Standing crops, Fluorescence, Chlorella, Chlamydomonas, Water quality, *Methodology, Evaluation, Measurement, Pollutant identification.
Identifiers: *Algal growth potential, Image analysis, Particle counter.

Three methods for measuring algal growth are described: (1) Algal growth was expressed as milligrams dry weight per liter with use of the electronic particle counter for determining cell number and cell volume. A gravimetric constant in milligrams dry weight per cubic micrometer was deter-

mined. This constant was applicable throughout the growth curve since there was a linear relationship between total cell weight and total cell volume. Chlorella vulgaris and Selenastrum capricornutum exhibited similar growth curves when growth was expressed as cells per liter or as milligrams dry weight per liter; (2) The image analysis system was used to count different types of algae in a mixed culture. C. reinhardtii, C. vulgaris, and Anacystis nidulans were not grossly distorted by the sample preparation method and could be distinguished from one another by variations in morphology. The counts could be separated by computing the ratio of area to length for each particle and by allowing the computer to sort and count each of the three types; (3) Fluorescence was a sensitive measure of growth on a laboratory prepared medium since there was a logarithmic relationship between fluorescence and cells per milliliter for both C. vulgaris and S. capricornutum. Fluorescence measurements were not satisfactory for determining growth in samples of varying chemical composition because the chlorophyll-to-cell ratio varied with media composition. (Woodard-USGS)
W77-02018

INDEXES ASSOCIATED WITH INFORMATION THEORY IN WATER QUALITY,
Geological Survey, Menlo Park, Calif.
S. M. Zand.
Journal Water Pollution Control Federation, Vol 48, No 8, p 2026-2031, August 1976. 1 fig, 1 tab, 13 ref.

Descriptors: *Water quality, *Biochemistry, *Biological communities, *Distribution patterns, Ecosystems, Evaluation, *Bioindicators.
Identifiers: *Diversity index, Species.

In many biological studies of water quality, a diversity index is calculated in 'bits per individual' using Shannon's approximation to Brillouin's formula. Short-comings associated with such use of Shannon's formula and its associated parameters are discussed. It is suggested that: (1) biological sample collection and analysis be standardized prior to use for comparison of diversity indexes and their associated parameters among various aquatic systems, (2) diversity index be measured in 'sits per individual' rather than the presently used unit of 'bits per individual', and (3) to evaluate the uniformity of distribution of individuals among species in a sample, relative evenness be used. Values of diversity indexes using Brillouin and Shannon formulas, both in bits and sits per individual, and relative evenness are given for 16 hypothetical samples. (Woodard-USGS)
W77-02025

LIMNOLOGICAL SURVEY OF SACONY CREEK BASIN, BERKS COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
J. L. Barker, and K. P. Kulp.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 270, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 76-84, August 1976. 39 p, 4 fig, 9 tab, 20 ref.

Descriptors: *Aquatic environment, *Benthos, *Fish populations, *Water quality, *Watersheds(Basins), *Pennsylvania, Limnology, Biomass, Sampling, *Data collections, Evaluation, *Pollutant identification.
Identifiers: *Sacony Creek basin(Pa), Berks County(Pa).

Samples of water, fish, and benthic macroinvertebrates collected at 10 sampling stations over a 10-month period indicate that Sacony Creek and its major tributaries in Berks County, Pennsylvania, possess water of good to excellent quality. No excessive quantities of dissolved nutrients, oxidizable matter, or fecal coliform bacteria were detected. Fish inhabitants include a sizable wild trout population in the upper Sacony basin and a diverse warm-water population, dominated by white suckers (Catostomus commersoni), in the lower basin. A population of 590 trout or 119 pounds per acre was estimated for good habitat in the upper basin. A maximum standing crop of 558 pounds per acre was measured at one of the more productive reaches. Benthic macroinvertebrate collections tended to support the water chemistry and fish population studies. Diversity and redundancy ranged from 2.44 to 3.46 and 0.14 to 0.38, respectively. Such diversity and redundancy values indicate good quality water at all stations. (Woodard-USGS)
W77-02026

EVALUATION OF THREE COLLECTING METHODS FOR A RECONNAISSANCE OF STREAM BENTHIC INVERTEBRATES,
Geological Survey, Menlo Park, Calif., and Geological Survey, Anchorage, Alaska.
K. V. Slack, J. W. Nauman, and L. J. Tilley.
Journal of Research of the U S Geological Survey, Vol 4, No 4, p 491-495, July-August 1976. 5 tab, 16 ref.

Descriptors: *Water quality, *Benthic fauna, *Invertebrates, *Sampling, *Methodology, Evaluation, Alaska, Streams, *Pollutant identification.
Identifiers: *Taxa, Chironomidae, Plecoptera.

Information on benthic invertebrates is increasingly included in water-quality investigations. A 1-day reconnaissance of the Dietrich River, Alaska, included collection of benthic invertebrates. Three methods were used at each of five stations to increase sampling effectiveness and to evaluate each method. Chironomidae and Plecoptera comprised 91 percent of all individuals and 47 percent of all taxa in the combined faunal list. At each station, the most abundant organisms were taken by all methods but the less abundant ones by only one or two methods. The dip net collected the highest percentage of taxa, and the second highest percentage of individuals. The 10-rock method collected the highest percentage of individuals but was relatively ineffective for taxa. The drift net collected the fewest individuals, but the percentage of taxa was relatively high. Of the 27 unique taxa (those taxa collected by only one of the methods), 15 were collected by dip net, 8 by drift net, and 4 by the 10-rock method. Although the dip net was most effective for collecting taxa, more thorough scrubbing of substrates to remove clinging organisms probably would improve the techniques. (Woodard-USGS)
W77-02028

WATER RESOURCES OF THE RAINY LAKE WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-02032

WATER RESOURCES OF THE LITTLE FORK RIVER WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W77-02033

PANEL 'A' - AUTOMOTIVE EMISSIONS,
For primary bibliographic entry see Field 6G.
W77-02052

CONTROL OF AMBIENT SO2 CONCENTRATIONS BY NONCONTINUOUS EMISSION LIMITATION LARGE COAL-FIRED POWER PLANTS,
Tennessee Valley Authority, Muscle Shoals, Ala. Air Quality Branch.
For primary bibliographic entry see Field 6G.
W77-02059

5B. Sources Of Pollution

TRANSFORMATION OF CHEMICAL SUBSTANCES IN WATER BODIES AND DURING WATER TREATMENT AS A HYGIENIC PROBLEM, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5F.
W77-01552

VERTICAL DISTRIBUTION OF STRONTIUM-90 AND CESIUM-137 IN BOTTOM DEPOSITS OF RIVERS AND LAKES, (IN RUSSIAN),
K. P. Makhon'Ko, Ts. I. Bobovnikova, A. S. Avramenko, A. V. Dibtseva, and A. A. Volokitin.
Ekologiya 6(3), p 90-93, 1975.

Descriptors: *Spatial distribution, *Strontium radioisotopes, *Cesium, *Radioactivity, Bottom sediments, Lake sediments, Rivers, Lakes, Fallout, *Path of pollutants, Water pollution sources.

The maximum concentrations of 137Cs are observed at the surface of bottom deposits of river stretches with very weak currents due to the predominance of sorption over desorption. The 137Cs is predominantly desorbed in river stretches with strong currents, resulting in decreased concentration of the isotope in the surface layer. 90Sr is more easily washed out of the surface of bottom deposits than 137Cs, leading to an increased 137Cs/90Sr ratio. In nonflowing lakes the maximum isotope concentrations are observed on the surface of the bottom deposits, and in flowing lakes they are deeper due to washing out of the isotopes from the surface layer. A second concentration peak of 137Cs and 90 Sr was observed at a depth of about 0.5m; it is probably related to the period of intense radioactive fallout in 1963.
W77-01560

EVALUATION OF THE SELF-PURIFYING ABILITY OF WATERS OF THE LOWER DON, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 5G.
W77-01569

STUDY ON THE CHARACTERISTIC DISTRIBUTION OF PHOSPHATE IN JUNHAE BAY, (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
C. K. Park.
Bull Korean Fish Soc 8(2), p 68-72, 1975.

Descriptors: *Phosphates, *Distribution, *Fertilizer, Water quality, Bays, *Path of pollutants, Oysters, Fisheries, Asia.
Identifiers: *Junhae Bay(So. Korea).

The effect of wastewater from a chemical fertilizer plant on water quality in Junhae Bay, South Korea, was studied from Feb.-Dec. 1927. Phosphate distribution was significantly higher inside than outside the bay. Phosphate concentration was highest in Hengam Bay where the chemical fertilizer plant was located, and it gradually diffused to the whole bay area. At station 28 the mean value of phosphate was more than 10 times greater than that in 1967 when the fertilizer plant was constructed. In Geoje Bay, the center of oyster culture, phosphate concentration was lower than outside the bay.
W77-01571

CONSIDERATIONS ON THE WASTE WATER QUALITY AND TREATMENT AT THE AN-

TIBIOTICS PLANT FROM JASSY, (IN HUNGARIAN),
For primary bibliographic entry see Field 5D.
W77-01580

SURFACE WATER POLLUTION-THE CATCHMENT AREA AT SANDEFJORD, (IN NORWEGIAN),
Norsk Institutt for Vannforskning, Blindern.
O. Lindholm, and P. Balmer.
Vatten 31(3), p 253-264, 1975.

Descriptors: *Monitoring, Combined sewers, Rainfall, Watersheds(Basins), Basins, *Path of pollutants, *Fjords, Phosphorus, Nitrogen, Lead, Suspended solids, Organic matter, Biochemical oxygen demand, Chemical oxygen demand, Water pollution.
Identifiers: *Sandefjord(Norway).

Monitoring of pollution in the discharge from a catchment area of 380 ha in Sandefjord, Norway, served by a combined sewer system were performed during 7 rainfall events. The catchment consists of 70 ha farm land, 30 ha downtown areas and 280 ha of one-family houses. In the catchment area 9000 persons reside; additional loads are equivalent to the load of 600 persons. The annual additional load caused by wet weather periods is expressed as a percentage of the ordinary annual load of the sanitary sewage: 7-day biochemical O2 demand, 58%; chemical O2 demand, 63%; total P, 17%; total N, 12%, suspended solids, 332%; and Pb. 167%. The intensity of the pollutants being washed out decreased with the time from the start of the rainfall. Pollutant transport in a certain time correlated to the level of water discharge at the same moment. The content of suspended solids, organic matter and Pb in the runoff was correlated to the period of dry weather preceeding the rainfall. Suspended solids and organic matter followed the first flush principle.
W77-01587

THE DEPENDENCE OF ASSIMILATION NUMBER AND CHLOROPHYLL CONCENTRATION ON WATER PRODUCTIVITY IN DIFFERENT TEMPERATURE AREAS OF THE WORLD OCEAN, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 5C.
W77-01591

PHYTOPLANKTON DISTRIBUTION IN THE SCOTIA SEA AS RELATED TO VERTICAL WATER CIRCULATION, (IN RUSSIAN),
All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
O. A. Movchan.
Okeanologiya 15(4), p 708-712, 1975.

Descriptors: *Phytoplankton, Distribution, Water circulation, *Atlantic Ocean.
Identifiers: *Scotia Sea.

In phytoplankton material from the Scotia Sea (South Atlantic), maximum quantities of phytoplankton were found in the areas of the most intensive vertical water circulation and high stability of the water layers, i.e., under conditions characteristic of frontal zones. The phytoplankton maximum ware recorded in the upwelling zone and in the sinking zone.
W77-01592

THE SPECIES, SIZE AND AGE COMPOSITION OF FISHES IN DONETS PART OF WARM WATER SEWAGE BY LUGANSK STATE REGIONAL ELECTRIC POWER STATION, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Zoologii.
For primary bibliographic entry see Field 5C.
W77-01608

QUALITY OF GROUND WATER IN THE COASTAL AQUIFER NEAR VISAKHAPATNAM, INDIA,
Andhra Univ., Waltair (India). Dept. of Geophysics.
V. V. Jagannadha Sarma, and N. Krishnaiah.
Ground Water, Vol. 14, No. 5, p 290-295, September-October 1976. 3 fig, 3 tab, 9 ref.

Descriptors: *Water quality, *Coasts, *Groundwater, Aquifers, Water wells, Sampling, Brackish water, Geologic control, Hydrogeology, Saline water intrusion, Sea water, Calcium, Magnesium, Chlorides, Bicarbonates, Hydraulic gradient, Conductivity, Hardness(Water), Alkalinity.
Identifiers: *India, *Ghyben-Herzberg relation, Ratios, Sodium adsorption ratio.

A study of the quality of groundwater from 250 open wells in the coastal aquifer of Kaniti-Paravada near Visakhapatnam, India brought out the fact that the occurrence of highly brackish waters in certain localized pockets is due to the hydrogeological processes going on in the area and not due to the influence of the sea. The phenomenon was verified by determining standard ratios of tracing sea-water contamination like Ca/Mg, Cl/HCO sub 3 and T sub A/T sub H. Conductivity and sodium adsorption ratio were also determined for finding out the alkali hazard to supplement the observations. (Visocky-ISWS)
W77-01626

THE MINERALOGY AND GEOCHEMISTRY OF THE SEDIMENTS OF NORTHWESTERN LAKE VICTORIA,
Lakehead Univ., Thunder Bay (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W77-01630

GRAVITATIONAL CIRCULATION IN LONG ISLAND SOUND,
State Univ. of New York at Stony Brook, Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W77-01634

DETERMINING THE SOURCE OF NITRATE IN GROUND WATER BY NITROGEN ISOTOPE STUDIES,
Texas Univ. at Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 5A.
W77-01636

EVALUATION OF THE USE OF SALT BRINE FOR DEICING PURPOSES,
Connecticut Dept. of Transportation, Rocky Hill, Materials Testing Lab.
For primary bibliographic entry see Field 4C.
W77-01639

WASTE WATER CONTROL -- DEMONSTRATED FOR A RIVER PROFILE (ABWASSERKONTROLLE -- DEMONSTRIERT AN EINEM FLUSSPROFIL),
Leykam-Muerztaler A. G., Gratkorn (Austria).
U. Wischenbart.
Das Papier, Vol. 30, No. 7, p 295-302, July, 1976. 12 fig, 2 tab.

Descriptors: *Water pollution, *Pulp wastes, Rivers, River flow, Water pollution sources, Wastes, *Industrial wastes, Foreign countries, Streams, Europe, *Monitoring, *Chemical oxygen demand, *Biochemical oxygen demand, Streamflow, Seasonal, Industrial wastes, Municipal wastes, Lignins, Running waters, *Waste assimilative capacity.
Identifiers: *Mur River(Austria), Austria, Lignosulfonates.

An approximately 300 km section of the Mur River in Austria was monitored at 12 points with respect to effluent loading to establish a pollution profile. The role of various industries as well as municipalities was determined. Daily peak loads were observed, and the behavior of introduced polluting agents over intermediary stretches of the river was followed, with particular attention being paid to the action of pulp mill effluents. By determining transported daily loads, comparisons for different seasons and different levels of flow could be made. The extensive data obtained were used in correlating COD and BOD values to calcium lignosulfonate contents. (Speckhard-IPC)
W77-01648

TOXIC CONSTITUENTS IN WOODROOM EFFLUENTS,
B. C. Research, Vancouver (British Columbia).
A. B. McKague, J. M. Leach, R. N. Soniassy, and A. N. Thakore.
In: Canadian Wood Chemistry Symposium, September 1-3, 1976, Mont Gabriel, Quebec, Canada. Canadian Pulp and Paper Association, Montreal, Quebec, p 129-135. 6 fig, 28 ref, 3 tab.

Descriptors: *Toxicity, *Bark, *Industrial wastes, *Water pollution sources, Wastes, Effluents, Pine trees, Fir trees, Anaerobic digestion, Waste water treatment, Waste treatment, Pulp wastes, Pulp and paper industry, Organic acids.
Identifiers: *Groundwood mills, Spruce trees, Resin acids, Wood extractives, Fatty acids.

Principal toxic components in effluents from wet debarking of spruce, pine, and fir species were abietic, palustric, dehydroabietic, neoabietic, isopimaric, pimaric, and sandaracopimaric resin acids. Oleic, linoleic, and linolenic acids were minor toxic contributors to the acidic materials in some effluent samples. Neutral extractives, such as abienol, 13-epimanool, (12E)-abienol, pimarol, and isopimarol accounted for the remaining toxicity of softwood debarking waste streams. Abienol was converted to tetrahydroepimanool during anaerobic fermentation of woodroom effluents. (Sykes-IPC)
W77-01667

CHEMISTRY OF WEST COAST GROUNDWOOD EFFLUENT TOXICITY,
MacMillan Bloedel Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5C.
W77-01668

PHENOLIC AND CHLOROPHENOLIC OLIGOMERS IN CHLORINATED PINE KRAFT PULP AND IN BLEACH PLANT EFFLUENTS,
State Univ. of New York at Syracuse. Empire State Paper Research Inst.
M. Erickson, and C. W. Dence.
In: Canadian Wood Chemistry Symposium, September 1-3, 1976, Mont Gabriel, Quebec, Canada. Canadian Pulp and Paper Association, Montreal, Quebec, p 75.

Descriptors: *Bleaching wastes, *Phenols, Effluents, *Gas chromatography, Aromatic compounds, Organic compounds, Water pollution sources, Softwood, Pine trees, Pulp wastes, Wastes, Chlorination, Oxidation, Mass spectrometry, Effluents, Separation techniques, Industrial wastes, *Pollutant identification, Lignins.
Identifiers: *Kraft pulp, Potassium permanganate, Chlorine compounds, Alkaline extraction.

Chlorinated softwood kraft pulp was washed with dilute HCl and subsequently extracted with alkali. The undiluted spent chlorination and caustic extraction liquors and the corresponding pulps were oxidized with potassium permanganate to convert the oligomeric phenolic residues contained therein to monomeric aromatic carboxylic acids which were then identified using combinations of gas

chromatographic and mass spectrometric techniques. Eleven phenolic derivatives were detected in the spent chlorination liquors (corresponding to 3.6 and 6.0% chlorine applications). Thirteen phenolic derivatives were identified in the spent caustic extraction liquors. Chlorinated pulps contained the same phenolic types as the chlorination liquors but in higher total concentrations. Permanganate oxidation of the caustic-extracted pulp revealed that all but traces of the phenolic substances had been removed in the combination of chlorination and extraction stages. (Sykes-IPC)
W77-01669

THE INFLUENCE OF TRICKLE IRRIGATION ON THE QUALITY OF IRRIGATION RETURN FLOW,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
For primary bibliographic entry see Field 5G.
W77-01680

THE EFFECT OF PARK USE ON SURFACE WATER QUALITY,
Max C. Fleischmann Coll. of Agriculture, Reno, Nev. Div. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 5C.
W77-01692

ARTESIAN AQUIFERS,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 4B.
W77-01761

MONITORING GROUND-WATER QUALITY: METHODS AND COSTS,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
L. G. Everett, K. D. Schmidt, R. M. Tinlin, and D. K. Todd.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 133, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Monitoring Series, EPA-600/4-76-023, May, 1976. 141 p, 30 fig, 18 tab, 125 ref.

Descriptors: *Monitoring, Data collections, *Measurement, *Groundwater, *Costs, *Vadose water, Wells, *Water quality, Aquifer characteristics, Water analysis, Water chemistry, Water temperature, Test procedures, Model studies, Methodology, Pollutant identification, *Water pollution sources.
Identifiers: *Saturated zone, *Unsaturated zone, *Groundwater monitoring costs.

Most ground-water monitoring programs have concentrated on the saturated zone for indications of pollution. These programs usually do not consider supplemental information that is available through analyzing the unsaturated zone and the land surface. A number of techniques have been developed for monitoring water movement and water quality in the topsoil and unsaturated zone. These techniques include shallow wells, neutron moderation or moisture logging, tensiometers, electric resistance blocks, piezometers, psychrometers, tracers, fiberglass probes, lysimeters, suction cups, and salinity sensors. Monitoring of the land surface can be divided into nonsampling and sampling methods. The non sampling methods can be further divided into wasteload inventory considerations, leaching potential calculations, pipeline and tank tests, artificial liner testing, aerial surveillance, and notification and emergency procedures. The sampling methods are divided into those for surface water bodies, wastewater, and solid wastes. Saturated zone monitoring methods are tailored for predicting groundwater movement and the determination of geochemical considerations which affect natural ground water quality. These methods are grouped in the general areas of water levels, groundwater movement, pump tests, water budgets, groundwater modeling and water temperature and chemical water quality studies. (Heiss-NWWA)
W77-01771

MONITORING GROUNDWATER QUALITY: ILLUSTRATIVE EXAMPLES.
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 936, Price codes: A05 in paper copy, A01 in microfiche. EPA Environmental Monitoring Series, EPA-600/4-76-036, July, 1976. 82 p, 18 fig, 8 tab, 37 ref. R. M. Tinlin (editor).

Descriptors: Water pollution, *Water pollution sources, *Groundwater, *Monitoring, Data collections, Measurement, Arkansas, New York, Connecticut, Arizona, California, Oxidation lagoons, Industrial wastes, Oil fields, Nitrates, Brines, Septic tanks, Landfills, Leachate, Sewage, Pollutant identification.
Identifiers: *Oil-field brines, *Plating wastes, *Landfill leachate.

Five case histories of actual on potential groundwater pollution are presented with the monitoring techniques which were employed as well as a restrospective view of these techniques and their efficacy. The case histories cover brine disposal in Arkansas, industrial chrome plating waste contamination in Long Island, New York, landfill leachate pollution in Milford, Connecticut, an oxidation pond near Tucson, Arizona, and multiple-source nitrate pollution in the Fresno-Clouis, California metropolitan area. Four hypothetical illustrative examples for developing and selecting monitoring alternatives based on cost comparisons between other alternatives and hydrologic judgment are also given. These include agricultural effluent return flow, septic tank effluent contamination, percolation pond pollution, and solid waste landfill contamination. (heiss-NWWA)
W77-01772

MONITORING GROUNDWATER QUALITY: DATA MANAGEMENT,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
N. F. Hampton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 492, Price codes: A04 in paper copy, A01 in microfiche. EPA Environmental Monitoring Series, EPA-600/4-76-019, April, 1976. 63 p, 4 fig, 10 tab, 30 ref.

Descriptors: *Data storage and retrieval, *Data transmission, *Monitoring, *Groundwater, Aquifers, Aquifer characteristics, California, Colorado, Texas, Tennessee, *Pollutant identification, *Water pollution sources, *Water quality.
Identifiers: *Groundwater data management, Water quality data.

Effective ground-water quality management requires that relevant data be available to the manager in a concise, comprehensive, timely, economical and reliable manner. The prevalent proximity of the ground-water manager to the source of the data as well as the specialized needs of individual users indicates that decentralized (localized) ground-water data management systems are appropriate. A centralized (federal) data management system is called for as well, for the coordination of the national effort, the provision of interim ground-water data management support, the achievement of economics of scale and the encouragement of local compliance with national ground-water monitoring requirements. Consequently, the development of comprehensive ground-water information management capabilities should be implemented at the Federal, State and, where necessary, at local levels. The volume of data likely to be involved at the federal level dictates the need for a computerized system, below the federal level this may not be required. Some states, however, have already developed a computerized capability to maintain ground-water surveillance data (California, Colorado, Texas and Tennessee). Data indexing and the management of document citations are capabilities which can be provided,to agencies below the federal level, by existing federal systems. (Heiss-NWWA)
W77-01773

PROCEDURES MANUAL FOR MONITORING SOLID WASTE DISPOSAL SITES,
Wehran Engineering Corp., Middletown, N. Y.
D. Fenn, and E. Cocozzan.
United States Environmental Protection Agency, Office of Solid Waste Management Programs, 1976. 287 p, 61 fig, 15 tab. 68-01-3210.

Descriptors: *Landfills, *Monitoring, *Groundwater, *Water pollution, *Leaching, *Water quality, Control systems, Data collections, Maintenance, Administrative agencies, *Waste disposal, Leachate, Costs, Pollutant identification, Publications.
Identifiers: *Sanitary landfill monitoring, Monitoring costs, Monitoring program implementation.

More than 90 percent of our Nation's solid waste is deposited in or on the land surface for disposal. Leacate from this volume of waste is a serious problem in the areas of ground and surface water pollution. Ground-water pollution by leachate is insidious and requires a monitoring system to detect and delineate areas affected. Monitoring is implemented in two basic ways; the monitoring of existing sites, where ground-water contamination has already occured, and monitoring at new sites where no contamination has occured. Strategy for enforcement of monitoring must be formulated and implemented on a policy basis for state and municipal monitoring agencies. The limitations of monitoring must be delineated for the monitoring site. Contaminates measured and levels must be considered in the monitoring system design. The cost monitoring is a major factor in any system design. Costs will vary directly with the purpose and therefore the level of the monitoring program. In order to establish an effective state program, it must proceed simultaneously with enforcement and locating alternatives with a systematic approach and a good data base. The state must possess a working knowledge of the hydrogeological setting and the probable extent of contaminant transport at all existing landfill sites. By these considerations and use of a step outline of monitoring procedures listed, a state or local monitoring system can be planned, implemented, and maintained. (Heiss-NWWA)
W77-01774

MONITORING GROUNDWATER QUALITY: MONITORING METHODOLOGY,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
D. K. Todd, R. M. Tinlin, K. D. Schmidt, and L. G. Everett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 068, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency Environmental Monitoring Series, EPA-600/4-76-026, June, 1976. 154 p, 52 fig, 15 tab, 119 ref.

Descriptors: *Monitoring, Water pollution control, *Groundwater, *Aquifers, *Pollution abatement, *Water pollution sources, Data collections, Networks, *Methodology, Water quality, Pollutant identification.
Identifiers: *Groundwater monitoring methodology, *Monitoring programs.

The basic purpose of a monitoring methodology for monitoring ground water pollution is to provide

a framework for the planning and development of a monitoring program. Source monitoring, which involves the measurement of effluent quantity and quality for pollution sources which may affect groundwater is the primary monitoring methodology used. The methodology should serve to assist local monitoring agencies in the design and implementation of a monitoring program, and to guide state and national governmental agencies in establishing realistic monitoring priorities. The ground-water pollution monitoring program should include the following 15 steps. (1) Selection of a monitoring area, (2) Identification of pollution sources, (3) Identification of potential pollutants, (4) Definition of ground-water usage, (5) Definition of the hydrogeologic situation, (6) A study of existing ground-water quality, (7) An evaluation of infiltration potential for waste at the land surface, (8) An evaluation of the mobility of pollutants from the land surface to the water table, (9) An evaluation of attenuation of pollutants in the saturated zone, (10) A prioritization of sources and causes, (11) An evaluation of existing monitoring programs, (12) Establishment of alternative monitoring approaches, (13) Selection and implementation of the monitoring program, (14) Review and interpretation of monitoring results, and (15) Summarization and transmission of monitoring information. These steps taken together constitute a monitoring methodology which can assist a monitoring agency of any location to initiate a groundwater pollution monitoring program. (Heiss-NWWA)
W77-01775

A MANUAL OF LAWS, REGULATIONS, AND INSTITUTIONS FOR CONTROL OF GROUND WATER POLLUTION,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W77-01776

WATER POLLUTION INVESTIGATION: GENESEE RIVER AND ROCHESTER AREA,
O'Brien and Gere Engineers, Inc., Syracuse, NY.
For primary bibliographic entry see Field 5C.
W77-01785

WATER POLLUTION INVESTIGATION: BUFFALO RIVER,
Versar, Inc., Springfield, Va. General Technologies Div.
For primary bibliographic entry see Field 5C.
W77-01786

SEASONAL ABUNDANCE AND HORIZONTAL DISTRIBUTION OF PLANKTONIC CRUSTEACEA OF GEORGIAN BAY,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-01799

A PRELIMINARY REPORT ON THE BENTHIC MACROINVERTEBRATES OF GEORGIAN BAY AND NORTH CHANNEL,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-01800

THE DEMONSTRATION AND STANDARDIZATION OF A METHOD FOR MONITORING THE ECOLOGICAL EFFECTS OF MARINE WASTE DISCHARGES.
Biome Co., Inc., Surfside, Calif.
For primary bibliographic entry see Field 5A.
W77-01806

DIFFUSE AGRICULTURAL POLLUTION: THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS,
Wisconsin Univ. - Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W77-01810

NITRATE AND PHOSPHATE: TIME-TREND CONCENTRATIONS IN SELECTED KANSAS STREAMS,
Kansas Water Resources Research Inst. Manhattan.
P. Hulen, and E. Angino.
Completion Report, KWRRI Contribution No. 176, Aug 1976. 51 p, 32 fig, 3 tab, 23 ref. OWRT A-074-KAN(1). 14-34-0001-6017.

Descriptors: *Phosphates, *Nitrates, *Kansas, Water quality, Rivers, *Water pollution sources, *Path of pollutants, Time of concentration, Forecasting, River forecasting, Data collections, Pollutant identification.
Identifiers: *Time-Trend concentrations(Stream pollutants), Republican River(Kan), Arkansas River(Kan), Kansas River(Kan).

A review of the historical data (Water Quality Records) for 13 selected rivers draining different parts of the State of Kansas were examined to determine: (1) whether an increase in the NO3 - PO4 concentration in streams over time occurs, (2) to determine the rate of increase, and (3) to use the data to provide guidance on future trends. Data on phospate concentrations in Kansas streams are scarce. The PO4 concentration is approximately on the order of a magnitude lower than that of nitrate. The PO4 time-trends indicated do provide cause for concern in the future. This is especially so for the Republican River at Concordia and the Arkansas River at Dodge City. Mean nitrate concentrations in many Kansas streams show an increasing trend in the period 1962-1974. The greatest rate of increase of mean nitrate concentration with time is for the Arkansas River at Dodge City. For the Kansas River at Bonner Springs and Marais de Cygnes at Ottawa the nitrate level is decreasing. Overall it seems doubtful from the time-trend data examined for nitrate that future increases would exceed those presently indicated.
W77-01818

SHALLOW GROUND-WATER SALINIZATION IN DRYLAND FARM AREAS OF MONTANA,
Montana Univ., Missoula. Dept. of Geology.
G. R. Thompson, and S. G. Custer.
Montana University Joint Water Resources Research Center Report No. 79. Montana State University, Bozeman, September 1976. 214 p, 21 fig, 15 tab, 205 ref, 7 append. OWRT-A-094-MONT (1). 14-34-0001-6027.

Descriptors: *Groundwater, *Water pollution, *Salinity, Soil conservation, Sodium, Magnesium, Sulfates, Nitrates, Ammonium compounds, *Montana, *Water chemistry, Bacteria, Cultivation.
Identifiers: *Saline seep, Eastern Montana, Summer fallow, Colorado shale, *Groundwater salinity.

Saline seeps have developed on 106,000 ha in Montana between 1954 and 1975 due to excess percolation of water below the rootzone in response to irrigation and summer fallow. The ground water below paired cultivated and uncultivated dryland-farm sites on Colorado Group shale near Rapelje, Stillwater County, Montana, contains about 9000 ppm total dissolved solids at both sites and is dominated by sodium, magnesium, calcium and sulfate. Bedrock environment of deposition, weathered and unweathered mineralogy, exchangeable cations, and ground-water chemistry indicate that the salinity source is rock weathering. Nitrate is present in ground water (1505 kg/ha) below cultivated land and is absent below uncultivated land. The only source which quantitatively accounts for the profile excess is conversion of organic nitrogen to nitrate by bacteria in response to increased aeration and moisture content due to cultivation. Consideration of excess deep percolation, lithology, and surface and subsurface topography provide a basis for identifying seep-prone areas at the local level. Moisture management with new cropping techniques remains the key to amelioration of the saline seep problem. (Stuart-Montana State)
W77-01822

ON-LINE SURVEILLANCE OF INDUSTRIAL EFFLUENTS EMPLOYING CHEMICAL-PHYSICAL METHODS OF FISH AS SENSORS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W77-01823

POLLUTION OF THE RIVER TYNE ESTUARY--THE USE OF MATHEMATICAL MODELS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
A. James.
Journal of the Institute of Water Pollution Control, Vol. 75, No. 3, p 322-340, 1976. 24 fig, 1 tab.

Descriptors: *Water pollution control, *Mathematical models, *Dissolved oxygen, *Nutrients, *Rivers, *Estuaries, Hydraulics, Tides, Salinity, Biochemical oxygen demand, Equations, Systems analysis, Path of pollutants.
Identifiers: *River Tyne Estuary(Great Britain), North Sea.

During the past 15 years, the Civil Engineering Department of the University of Newcastle upon Tyne has carried out numerous studies of conditions in the estuary of the River Tyne. The study results have been formulated into mathematical models to help gain a numerical insight into the causes of present conditions and predict the results of future policies. This paper deals with the mathematical analysis and interpretation of the results obtained by Gay, Head, Ratasuk and James; included are details of methods. The work fell into three categories: dissolved oxygen studies; nutrient studies; and bacteriological studies. Herein, the first two are considered. At the end of the article are a discussion and a reply to the discussion. (Bell-Cornell)
W77-01889

AGRICULTURAL WATER POLLUTION: SOME PROBLEMS ASSOCIATED WITH ITS CONTROL,
Kansas Univ.. Lawrence. Dept. of Geography.
For primary bibliographic entry see Field 5G.
W77-01898

THE EFFECT OF THE NON-IDEAL COMPOSITION OF SEA WATER ON SALINITY AND DENSITY,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2L.
W77-01911

EFFECTS OF URANIUM MINING AND MILLING ON GROUND WATER IN THE GRANTS MINERAL BELT, NEW MEXICO,
Office of Radiation Programs, Las Vegas, Nev.
For primary bibliographic entry see Field 5C.
W77-01923

EVIDENCE OF SALT-WATER INTRUSION IN SOUTHEASTERN LONG ISLAND,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
M. P. Anderson, and C. A. Berkebile.

Ground Water, Vol. 14, No. 5, p 315-319, September-October 1976. 6 fig, 2 tab, 19 ref.

Descriptors: *Well data, *New York, *Groundwater, *Saline water intrusion, Groundwater movement, Chlorides, Wells, Hydrology, Hydrogeology, Water table, Networks, Sampling.
Identifiers: *Long Island, Groundwater level, Firewells.

A pre-existing network of 124 wells used for fire protection in the Town of Southampton, Long Island, New York, was monitored during a one-year period for groundwater levels and chloride concentrations. Water from 26 wells had chloride concentrations of 50 mg/l or greater, and in 17 of the wells, the chloride concentration exceeded 200 mg/l. Of the mentioned 26 wells, nineteen were located in two densely populated areas. The possibility of widespread intrusion in the wells of one of the densely populated areas had not been previously documented. In addition, detailed water table contour maps were presented for selected areas within the town. (Lee-ISWS)
W77-01924

DISPERSION OF POLLUTANTS IN THE STRAIT OF CANSO,
Nova Scotia Technical Coll., Halifax. Dept. of Chemical Engineering.
S. T. Wang, A. F. McMillan, and B. H. Chen.
Water Resources Bulletin, Vol. 12, No. 4, p 779-797, August 1976. 8 fig, 12 ref.

Descriptors: *Path of pollutants, *Mathematical models, Pollutants, *Straits, *Diffusion, *Dispersion, *Water circulaton, *Canada, *Atlantic Ocean, Model studies, Water pollution, Path of pollutants, Harbors, Channels, Coasts, Mixing, Movement, Winds, Wind tides, Waves(Water), Wind velocity, Chemical reactions, Equations.
Identifiers: *Strait of Canso, *Nova Scotia, Deep-water ports.

By using the method of successive approximations, the one-dimensional diffusion equation was solved for the distribution of pollutant from an instantaneous point source in a semi-infinite body of water under the influence of wind-generated waves. The solution was obtained with the aid of an expression developed in this study to relate the dispersion coefficient to wind speed, characteristics of a wind-generated wave, and drift current velocities. The results indicated that the wave causes the local concentration to oscillate with respect to time around a mean concentration distribution curve. The period of the oscillation is about that of the wave, and its amplitude is always less than 7% of the mean. The effect of a chemical reaction is to reduce the level of pollutant concentration, the magnitude of the reduction being dependent upon both the rate constant and the order of reaction. The case of simultaneous dumping of one pollutant at different sites was also considered. (Bender-ISWS)
W77-01928

OPTIMAL ESTIMATION OF DO, BOD, AND STREAM PARAMETERS USING A DYNAMIC DISCRETE TIME MODEL,
Purdue Univ., Lafayette, Ind. Dept. of Electrical Engineering.
A. J. Koivo, and G. Phillips.
Water Resources Research, Vol. 12, No. 4, p 705-711, August 1976. 9 fig, 10 ref.

Descriptors: *Path of pollutants, *Model studies, *Optimization, *Biochemical oxygen demand, *Dissolved oxygen, *Streams, *Mathematical models, Computer models, Dynamic programming, Organic matter, Water quality, Water pollution, Pollutants, Reaeration, Self-purification, Waste assimilative capacity, Equations, Mathematical studies.
Identifiers: *Streeter-Phelps model, *Optimal estimation, Kalman filter.

A modified Streeter-Phelps equation was used as the starting equation to obtain a discrete time mathematical representation which represents a model for the biological oxygen demand and the dissolved oxygen concentrations in a polluted stream. The unknown parameters to be estimated were treated as state variables in order to compute their numerical values from noise-corrupted measurements. An optimal estimator was constructed for the estimation of the unknown parameters. The optimization scheme can be implemented in a small computer. The approach was illustrated by a numerical example. (Bender-ISWS)
W77-01930

AN ANALYSIS OF INSTABILITIES CAUSED BY SALINITY GRADIENTS IN GROUNDWATER,
Florida Univ., Gainesville. Dept. of Civil Engineering.
H. Rubin.
Journal of Hydraulic Research, Vol. 14, No. 3, p 217-228, 1976. 4 fig, 14 ref, append.

Descriptors: *Salinity, *Groundwater, *Convection, *Density, Stability, Groundwater movement, Velocity, Aquifers, Dispersion, Circulation, Equations, Flow, Boundary processes, Mathamatical studies, Permeability, Viscosity, Reynolds number, Currents(Water).
Identifiers: *Salinity gradients, Salinity transport, Flow field, Unperturbed velocity, Rayleigh number, Nusselt number.

Salinity gradients in groundwaters may lead to convection currents. The present study concerned stability criteria of the flow field as well as an analysis of the salinity transport due to finite amplitude disturbances. It was found that convection cells are always two dimensional rolls whose axes are parallel to the unperturbed velocity vector. Salinity transport through the aquifer is considerably increased due to the convection motion. Mechanical dispersion due to the convection motion reduces the intensity of salinity transport. (Visocky-ISWS)
W77-01931

CHARACTERIZATION OF URBAN RUNOFF - NEW JERSEY,
Rutgers - The State Univ., New Brunswick N.J. Water Resources Research Inst.
W. Whipple, Jr., J. V. Hunter, and S. L. Yu.
Partial Completion Report, June 1976. 89 p, 26 fig, 43 tab, 24 ref. OWRT C-5341(4239)(4).

Descriptors: *Water pollution sources, *Heavy metals, *Phosphates, *Storm water, *Urban hydrology, *Urban runoff, *Land use, Water pollution, Biochemical oxygen demand, Pollutants, Sediment yield, Nutrients, *New Jersey, Suspended solids, Organic loading.
Identifiers: Urban runoff pollution, Nonpoint pollution sources, *Saddle River(NJ).

Pollution from urban runoff in the Saddle River, N.J. was determined; specifically heavy metals, BOD, phosphates and suspended solids were measured. Techniques include use of single samples and of samples taken at short intervals throughout storm events. Results are compared to different types of land use, showing more pollution of all types from urban and industrial runoff than from residential area runoff. No relationship was found between pollution loadings and the length of time since the preceding storm. This finding is contrary to a usual assumption in modelling urban runoff pollution.
W77-01945

MATHEMATICAL MODELING FOR WATER QUALITY MANAGEMENT IN STREAMS UNDER UNSTEADY HYDRAULIC CONDITIONS,
Tennessee Univ., Knoxville. Dept. of Environmental Engineering.
D. E. Overton, and M. E. Meadows.
Tennessee Water Resources Research Center, Knoxville, Research Report No. 55, October 26, 1976. 119 p, 22 fig, 68 ref, 3 append. OWRT A-036-Tenn(1), 14-31-0001-5043.

Descriptors: *Dissolved oxygen, *Unsteady flow, Numerical methods, Water quality, Dispersion, *Mathematical models, Streamflow, *Model studies, Water management(Applied), Organic loading, Path of pollutants, Water pollution control.

For the purposes of water quality management studies, a rational mathematical model of the response of a stream water quality system to the wide range of waste inputs and streamflows is required. A one dimensional model describing the stream dissolved oxygen levels in time and space has been developed that is valid for any combination of steady and unsteady organic waste inputs and streamflow conditions. This model was formulated in terms of the principal source and sink for dissolved oxygen, atmospheric reaeration and biochemical oxygen demand, respectively. Additional sources and sinks may be combined linearly when appropriate. The unsteady hydraulics are described by the unsteady streamflow equations which are solved simultaneously with the coupled equations for dissolved oxygen. Solution of these four partial differential equations is best obtained through numerical integration techniques. A proven implicit integration scheme was chosen for the solution of the unsteady streamflow equations. The two equations profiling the dissolved oxygen were integrated using a four-point explicit scheme. The stability and accuracy of this numerical method has been demonstrated. A numerical experiment was conducted to demonstrate the model applicability for simulation of the effects of periods of unsteady streamflow on stream water quality. Results of the unsteady flow model were compared with the results of a steady flow model and conclusions drawn as to possible errors introduced by assuming steady flow.
W77-01946

SOUTHEASTERN FORESTS AND THE PROBLEM OF NON-POINT SOURCES OF WATER POLLUTION,
Forest Service (USDA), Franklin, N. C. Coweeta Hydrologic Lab.
J. E. Douglass.
In: Non-Point Sources of Water Pollution, Southeastern Regional Conference Proceedings 1975, May 1-2, 1975, Blacksburg, Virginia, Donaldson Brown Continuing Education Center, Virginia Polytechnic Institute and State University, Blacksburg, p. 29-44. 86 ref.

Descriptors: *Water pollution control, *Soil erosion, *Channel erosion, *Sedimention, Thermal pollution, Pesticide residues, Public health, Water quality, Runoff, *Southeast US, Path of pollutants, *Forest management, *Erosion control.

The 1972 Amendments to the Federal Water Pollution Control Act require that non-point source pollution from forestry activities be controlled. Erosion is the most serious pollutant originating from forestry activities. Activities which destroy the forest floor and reduce the infiltration rate of soil, such as mechanically preparing sites for tree planting, roads, skid trails, and logging decks, cause most accelerated erosion. Elevation of water temperature, changing the chemical composition of water by cutting or fertilizing stands, and introduction of pesticides and herbicides into streams are other common forms of pollution. Pollution from forestry operations can be minimized by utilizing existing information. However, there is need for additional quantification of pollution levels associated with alternative forestry practices, and for screening of known or development of new techniques for minimizing non-point source pollution. (Forest Service)
W77-01952

A MODEL FOR CALCULATING EFFECTS OF LIQUID WASTE DISPOSAL IN DEEP SALINE AQUIFERS, PART I--DEVELOPMENT.
Geological Survey, Austin, Tex.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256-903, Price codes: A12 in paper copy, A01 in microfiche. Water-Resources Investigations 76-61, June 1976. 263 p, 20 fig, 18 tab, 35 ref. Contractor: INTERCOMP Resource development and Engineering, Inc., Houston, Texas.

Descriptors: *Waste disposal, *Injection wells, *Computer models, *Aquifer characteristics, Deep wells, Saline water, Aquifers, Industrial wastes, Water pollution control, Groundwater movement, Model studies, Equations, Mass transfer, *Path of pollutants.
Identifiers: *Subsurface waste-disposal model.

A transient, three-dimensional subsurface waste-disposal model has been developed to provide methodology to design and test waste-disposal systems. The model is a finite-difference solution to the pressure, energy, and mass-transport equations. Equation parameters such as viscosity and density are allowed to be functions of the equations' dependent variables. Multiple user options allow the choice of x, y, and z cartesian or r and z radial coordinates, various finite-difference methods, iterative and direct matrix solution techniques, restart options, and various provisions for output display. The addition of well-bore heat and pressure-loss calculations to the model makes available to the ground-water hydrologist the most recent advances from the oil and gas reservoir engineering field. (Woodard-USGS)
W77-02010

NITROGEN AND PHOSPHORUS UPTAKE IN THE EVERGLADES CONSERVATION AREAS, FLORIDA, WITH SPECIAL REFERENCE TO THE EFFECTS OF BACKPUMPING RUNOFF,
Geological Survey, Tallahassee, Fla.
B. F. McPherson, B. G. Waller, and H. C. Mattraw.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028-796, Price codes: A06 in paper copy, A01 in microfiche. Water-Resources Investigations 76-29, June 1976. 120 p, 21 fig, 10 tab, 17 ref.

Descriptors: *Absorption, *Water quality, *Nitrogen, *Phosphorus, *Florida, *Marshes, Canals, Water conservation, Chemical analysis, Chemical properties, Biological properties, Dissolved oxygen, Nutrients, Trace elements, Aquatic plants, Sediments, Hydrology, Water supply.
Identifiers: *Everglades, *Everglades National Park, Water conservation areas, *Backpumping runoff.

In much of the water pumped into the northern Everglades, Florida, concentrations of inorganic nitrogen and phosphorus are relatively high. These nutrients are transported in the canals or into the peripheral marshes. Concentrations decrease sharply within 330 feet or less of the canals, whereas specific conductance remains essentially unchanged within this distance. The sharp decrease in inorganic nitrogen and phosphorus near the canal edge indicates net uptake in these shallow waters. Concentrations of nitrogen and phosphorus also decrease as water moves through the conservation areas in canals. This decrease is due partly to dilution by rainfall and runoff, and partly to net uptake in the canals and their peripheral marsh. The large canals of the northern and eastern parts of the conservation areas often have relatively low concentrations of dissolved oxygen which show little fluctuation within 24 hours. Backpumping 50 percent of the total annual canal runoff in southeast Florida would add from 990 to 6,160 tons of nitrogen and from 10 to 62 tons of phosphorus to the conservation areas. The bottom sediments of the Everglades are a sink for nitrogen and phosphorus. They can, however, be a source of these nutrients when anaerobic conditions exist at the water-sediment interface or when bottom material becomes resuspended. (Woodard-USGS)
W77-02012

CHEMICAL AND BIOLOGICAL QUALITY OF WATER IN PART OF THE EVERGLADES, SOUTHEASTERN FLORIDA,
Geological Survey, Tallahassee, Fla.
B. G. Waller, and J. E. Earle.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028-795, Price codes: A08 in paper copy, A01 in microfiche. Water-Resources Investigations 56-75, December 1975. 157 p, 17 fig, 20 tab, 23 ref.

Descriptors: *Water quality, *Surface waters, *Florida, *Chemial analysis, *Environmental effects, Land use, Chemical properties, Biological properties, Physical properties, Bottom sediments, Water chemistry, *Path of pollutants, *Pollutant identification.
Identifiers: *Everglades, *Everglades National Park, *Lake Okeechobee.

The quality of surface water in the agricultural area between Lake Okeechobee and the water conservation areas is markedly different from that of other surface water in southeastern Florida. Man has engaged in cultural activities, both agricultural and urban, which have affected the water quality in the northern and eastern segments of the area of investigation. The quality of the water improves, however, as it flows to the south and east because there is minimal input from man's activities and many of the constituents are assimilated by plants, sorbed on organic material and clay in the bottom sediments, and entrapped within the sediments. Because of these processes, the water entering Everglades National Park is of better quality than that entering the conservation areas in the north. (Woodard-USGS)
W77-02013

INDEXES ASSOCIATED WITH INFORMATION THEORY IN WATER QUALITY,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W77-02025

HYDROLOGICAL AND HYDRAULICAL CONCEPTUAL MODELS APPLICABLE TO OVERLAND AND RIVER TRANSPORT MODELING,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-02036

STATEMENT OF CONCERNS OF THE LAKE MICHIGAN TOXIC SUBSTANCES COMMITTEE RELATED TO POLYCHLORINATED BIPHENYLS,
Environmental Protection Agency, Chicago, Ill.
For primary bibliographic entry see Field 5C.
W77-02038

PICHIA SPARTINAE, A DOMINANT YEAST OF THE SPARTINA SALT MARSH,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 5C.
W77-02039

AGRICULTURAL AND OTHER NON-POINT SOURCES OF WATER POLLUTION,
Interstate Commission on the Potomac River Basin, Bethesda, Md.
For primary bibliographic entry see Field 5G.
W77-02053

AGRICULTURAL AND OTHER NON-POINT SOURCES OF WATER POLLUTION: NON-POINT SOURCES AND COST EFFECTIVENESS,
Enviro-Control, Inc., Rockville, Md.
For primary bibliographic entry see Field 5G.
W77-02057

THE EFFECTS OF WATER POLLUTION FROM NON-POINT SOURCES AS IT RELATES TO THE HEALTH OF MAN,
Health Science Associates, Inc., Bethesda, Md.
For primary bibliographic entry see Field 5G.
W77-02058

ARKANSAS RIVER WATER QUALITY RELATED TO THE IRRIGATION POTENTIAL OF ASSOCIATED SOILS,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
L. H. Hileman.
Arkansas Dept. of Commerce, Little Rock, Final Report, December 1974. 101 p, 46 fig, 7 tab, 12 ref, 5 append.

Descriptors: *Irrigation effects, *Soil contamination, *Soil analysis, Irrigation water, *Arkansas, Rates of application, Soil chemistry, Soil types, Soil classification, Sodium, Calcium, Magnesium, Leachate, Salts.
Identifiers: Arkansas River(Ark), Arkansas River Valley(Ark).

The effect of levels of sodium and other salts on soil chemical properties of the various soil types adjacent to the Arkansas River was studied to determine whether water from the Arkansas River could be used for irrigation purposes. Undisturbed soil cores three inches in diameter by twenty-four inches deep were collected from thirteen agriculturally important soil series in the Arkansas River Valley and subjected to gravity leaching. It was concluded that though the soil series varied greatly in their ability to accept irrigation water containing high sodium, high calcium, magnesium, or soluble salts, river water could be used to irrigate many areas in the Arkansas River Valley. Calcium, magnesium, and sodium leached readily through coarse and medium textured soils in proportion to: (1) the amount of these elements in the water, (2) the amount of clay in the soil, and (3) soil-water interaction. Generally, the greatest variability in the soil chemical analysis was found in the active root zone or the zero to eight inch soil depth. Sodium and soluble salts accumulated on the surface or in the plant root zone of fine textured or heavy clay soils, restricting their utility for agricultural irrigation. (Luedtke-Wisconsin)
W77-02065

STORMWATER STUDIES AND ALTERNATIVES IN ATLANTA,
Jordan, Jones. and Goulding, Inc., Atlanta, Ga.
R. F. Holbrook, A. I. Perez, B. G. Turner, and H. I. Miller.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE6, Proceedings paper No. 12614, p 1263-1277, December 1976. 2 fig, 10 tab, 14 ref.

Descriptors: *Combined sewers, *Erosion, *Land use, Urban runoff, *Storm water, Water quality, Computer models, Simulation analysis, Operating costs, Pollutants, Treatment, Alternative planning, Storage, Decision making, Rainfall, Systems analysis, Water management(Applied), Economics, *Georgia, Forecasting.
Identifiers: STORM model, *Atlanta(Geo), Data gathering and analysis, Cost effectiveness.

To identify the contribution of pollutants from urban runoff, a sampling program was established on four small streams in suburban areas of Atlanta. Approximately 100 runoff samples were collected during 15 summer storm events and the

Corps of Engineers' STORM model was calibrated using the quality, quantity, and land-use information obtained. The calibrated model was then utilized to predict pollutant loads (present and future) from 90 watersheds covering the Atlanta Urban area. Synthetic curves were developed to represent discharges from the 10 combined sewer overflows in the Atlanta area. These curves, along with specific site information, were used to identify treatment alternatives. Alternatives were screened and storage volumes and treatment capacities were chosen based on site availability, maximum removal of BOD5 and suspended solids, and public acceptance. Costs were assigned to alternatives at each overflow site and alternatives were chosen based upon cost-effectiveness. (Bell-Cornell)
W77-02073

WASTEWATER STORAGE-SIMULATION OF INSTREAM EFFECTS,
Kentucky Dept. for Natural Resources and Environmental Protection, Frankfort.
J. S. Tapp.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE6, Proceedings paper No. 12601, p 1151-1159, December 1976. 4 fig, 7 tab, 1 ref.

Descriptors: *Water quality, *Waste water disposal, *Simulation analysis, *Dissolved oxygen, *Discharge(Water), Computer models, Water storage, Equations, Biochemical oxygen demand, Systems analysis, Management, *Forecasting.
Identifiers: *Instream effects, Storage pond, Water flow.

Simulations using computer models to predict the instream effects of storing wastewater during periods of low streamflow and releasing during periods of high streamflow indicate that instream dissolved oxygen concentrations can be increased during low flow periods to a level necessary for fish and aquatic life survival. Equations relating allowable wastewater flow at a given effluent quality, streamflow, and temperature were developed as a guide for operating a wastewater storage pond. Without the storage pond in operation, instream dissolved oxygen concentrations were predicted to drop below that necessary for fish and aquatic life survival. With the storage pond in operation, the instream dissolved oxygen concentration was predicted to remain above 3 mg/l, indicating that wastewater storage is an alternative that should be considered when examining situations of low streamflow and high wastewater loading. (Bell-Cornell)
W77-02074

5C. Effects Of Pollution

LAND DISPOSAL OF LIQUID SEWAGE SLUDGE: III. THE EFFECT ON SOIL NITRATE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5D.
W77-01557

ENVIRONMENTAL FACTORS OF HUMAN LEUKEMIAS, (IN POLISH),
K. Janicki.
Polska Akademia Nauk: Kralow, Poland. 1974. 220 p.

Descriptors: *Correlation analysis, *Human diseases, Water supply, Fertilizers, *Environmental effects, Toxicity, Human population, Chemicals.
Identifiers: *Luekemias.

The correlation of leukemia incidence in Cracow, Poland, from 1961-1968 and certain environmental factors is presented. Leukemia incidence is characterized according to geographical area, sex, age and type of leukemia. Environmental factors include population numbers, use of plant-protective chemicals and artificial fertilizers, and water supply. Results are presented in tables and cartograms. Leukemia prophylaxis is discussed. Extensive Russian and English summaries are provided.
W77-01562

ALGAE OF THE LAKE CHAD REGION: I. GENERAL CHARACTERISTICS OF THE ENVIRONMENT, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de N'Djamena.
For primary bibliographic entry see Field 2H.
W77-01565

EFFECTS OF CADMIUM AND LEAD UPON THE INDIGENOUS HETEROTROPHIC MICROFLORA IN THE AQUEOUS ENVIRONMENT OF THE BRACKISH ESTUARY-WATER OF THE RIVER WESER, (IN GERMAN),
Institut fuer Meeresforschung, Bremerhaven (West Germany).
D. Thormann.
Veroeff Inst Meeresforsch Bremerhaven, 15(3), p 237-267, 1975.

Descriptors: *Cadmium, *Lead, Estuaries, Brackish water, Europe, Salinity, *Bacteria, Absorption, Toxicity, Estuarine environment.
Identifiers: *River Weser(West Germany), Heterotrophic microflora.

In agar media (10% salinity) containing Cd or Pb bacterial numbers were progressively reduced at 0.5-400 ppm Cd and at 100-400 ppm Pb. Only a few bacteria were able to form colonies at the highest concentrations. Lower salinity and low peptone-yeast-extract-concentrations of the medium increased the toxicity of Pb. The appearance of several brown-black pigmented colonies on the plates containing more than 200 ppm Pb was observed, but no dark pigment was noted when the same bacteria were grown in the absence of Pa. Different concentrations of Cd or Pb were added to water samples (as batch cultures) of the Weser Estuary (West Germany). The development of the indigenous microbial population was observed by subsequent counting of the viable heterotrophic bacteria on agar media. Cd was more toxic than Pb; there were differences in the kind of toxicity. The dissolved concentrations of Cd and Pb in the batch cultures were analyzed by atomic absorption. Cd dissolved considerably better than Pb in brackish water. Cd-and Pb-sensitive bacteria were isolated by a replica plating technique to carry out subsequent experiments on the microbial uptake of heavy metals. The most sensitive bacteria were growth-inhibited at 0.1 ppm Cd and Pb. Arthrobacter marinus is mentioned.
W77-01566

SUBMERSED MACROPHYTES AND THEIR COMMUNITIES AS INDICATORS OF WATER CONTAMINATION,
Universitaet Hohenheim (Landwirtschaftliche Hochschule) (West Germany).
A. Kohler.
Beitr Naturkd Forsch Suedwestdtsch, 34, p 149-159, 1975.

Descriptors: *Bioindicators, *Algae, Indicators, Water pollution, Aquatic animals, *Nutrients, Sewage, Oligotrophy, Pollutant identification.
Identifiers: *Macrophytes.

Until recently only animals and algae but not macrophytes were considered as biological water quality indicators. The indicator value of macrophytes appeared to play a part when organic sewage was introduced into uncontaminated oligotrophic water since the bloom shifted. Two types were differentiated. Many submerged macrophytes declined with contamination or disappeared entirely. A second group of submersed macrophytes underwent marked acceleration of vitality and propagation, followed by a dimunition of further growth increase with continuously increased contamination; finally overloading led to a limitation of macrophytes. A third group of submersed macrophytes were relatively insensitive to contamination. Nutrient concentration, sediment variation and turbidity may contribute to the conditional competitive vegetation variation of submersed macrophytes.
W77-01570

WATER QUALITY OF THE CULTURE BEDS OF HARD CLAM AND ADJACENT SEA OF THE YEOSU REFINERY OF HONAM OIL REFINERY COMPANY IN KWANG YANG BAY, (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
J. H. Won, and N. P. Go.
Bull Korean Fish Soc, 8(2), p 73-84, 1975.

Descriptors: Oil spills, Water quality, Clams, Oil pollution, Bays, Industrial wastes, Water pollution effects, Organic compounds, Fisheries.

The effects of oil spill from the wastewater of Yeosu Refinery on water quality of hard clam culture beds in Taein-Ri, Kwang Yang Bay, South Korea, were studied. Wastewater and oil spillage may reach culture beds in 6-8 h by tidal current movement. Water quality is nearly as normal as unpolluted sea water except the concentration of n-hexane extractive chemicals which was higher than unpolluted sea water in Sept.-Oct. 1973. It may be caused by wastewater of Yeosu Refinery.
W77-01572

RESEARCHES ON THE BIODEGRADABILITY AND TOXICITY OF SOME POLLUTANTS EXISTING IN WASTE WATERS DISCHARGED BY THE PETROCHEMICAL INDUSTRY, (IN HUNGARIAN),
A. Ilisescu, and L. Stefanescu.
Stud Epurarea Apelor 16(1-7), p 76-98, 1974.

Descriptors: *Biodegradation, *Toxicity, Industrial wastes, Activated sludge, *Organic compounds, Inhibition, Microorganisms, Daphnia.
Identifiers: Gobio, *Petrochemical pollutants, Propylamine, Toluenediamine.

The biodegradability and toxicity of various petrochemical industry wastes were studied. Isobutyl-alde-hyde, alpha-naphthol and isopropylamine are biodegradable; the last 2 compounds require a previous period of acclimatization. Dimethylamine and carbaryl are non-biodegradable and non-toxic for activated sludge microorganisms. Toluylenediamine and p-chloraniline are non-biodegradable and weakly inhibit sludge. For the 4 non-biodegradable compounds, the concentrations at which they do not modify organoleptic properties in river water and the concentrations below which toxic effects on river organisms is absent are listed. Daphnia and Gobio are mentioned.
W77-01581

THE BIODEGRADABILITY OF SOME ORGANIC POLLUTANTS PRESENT IN THE WASTE WATERS RESULTED FROM THE PETROLEUM REFINERIES, (IN HUNGARIAN),
For primary bibliographic entry see Field 5D.
W77-01583

PHYTOTOXIC PROPERTIES OF ANAEROBIC BACTERIA OF IRRIGATED SOILS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
V. I. Duda, and I. I. Chernomorchenko.
Biol Nauki (Mosc) 18(6), p 88-92, 1975.

Descriptors: *Anaerobic bacteria, Irrigated land, Wheat, Toxicity, Organic acids, Soils, Acids.
Identifiers: Acetic acid, Butyric acid, Formic acid, USSR, *Odessa region(USSR), Phytotoxicity.

From irrigated soils of the Odessa region (USSR) 195 cultures of anaerobic bacteria causing soil toxicosis were isolated. The culture liquid of many isolates had a pronounced phytotoxic effect on wheat. The toxicity was caused by organic acids, mainly acetic, butyric and formic, released by the anaerobes. When sterile soil was inoculated with pure cultures of anaerobic bacteria phytotoxic compounds were formed and accumulated in the soil.
W77-01590

THE DEPENDENCE OF ASSIMILATION NUMBER AND CHLOROPHYLL CONCENTRATION ON WATER PRODUCTIVITY IN DIFFERENT TEMPERATURE AREAS OF THE WORLD OCEAN, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
V. I. Vedernikov.
Okeanologiya 15(4), p 703-707, 1975.

Descriptors: *Chlorophyll, Temperature, *Oceans, *Waste assimilative capacity, Productivity, *Primary productivity, *Eutrophication, Mesotrophy, *Phytoplankton.

The most probable (phytoplankton) chlorophyll-a concentrations and assimilation numbers (mg C/mg/h) measured at optimum light intensity were determined for areas of different productivity in the polar, temperate and tropical regions of the World Ocean. When passing from oligotrophic to mesotrophic waters, the increase in primary production is attributed to the increase in the assimilation number and chlorophyll-a content of the water. When passing from mesotrophic to eutrophic waters, only the latter of these 2 values increases essentially.
W77-01591

ASSESSMENT OF CADMIUM IN FISHES FROM CARINTHIAN LAKES, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W77-01593

CHARACTER OF INTERRELATIONS BETWEEN CHIRONOMIDAE AND THEIR PARASITES, MERMITHIDAE, (IN RUSSIAN),
Akademiya Nauk Moldavskoi SSR, Kishinev.
A. A. Spasskii, N. S. Okonyi, and I. K. Toderash.
Dokl Akad Nauk Sssr Ser Biol 222(5), p 1254-1256, 1975.

Descriptors: *Diptera, *Animal parasites, Larvae, Biochemistry, Enzymes, Toxicity, Reservoirs, Insects, Midges.
Identifiers: Chironomus-plumosus, Hydromermis-sp, Imago, *Mermithidae, Metabolites, Moldavian-Ssr, Pupa, USSR, *Dubossary Reservoir(USSR), Dniestr River(USSR).

During a study of the biology of mass species of midges (Diptera, Chironomidae) of the Dubossary reservoir on the Dniestr River in the Moldavian SSR (USSR) intense infection of larvae, pupae and imagoes of Chironomus plumosus by mermithids of the genus Hydromermis was noted. A study of enzyme activity in exudates and homogenates of mermithid larvae indicated that the severe biochemical effects of parasitism may be the cause of death. The possibility of the toxicological effect of metabolites is not ruled out.
W77-01596

HYGIENIC STUDY OF THE TOXIC PROPERTIES OF METHANOL-CONTAINING RECLAIMED WATER, (IN RUSSIAN),
O. F. Ostapenko, V. A. Kryuchkov, A. N. Mal'kuta, V. G. Litau, and V. I. Solov'ev.
Kosm Biol Avia-Kosm Med 9(4), p 23-26, 1975.

Descriptors: *Water reuse, *Toxicity, *Water pollution effects, Rodents, Public health, Water purification.
Identifiers: *Methanol.

No significant changes in male white rats resulted from their 30 day consumption of reclaimed water which contained up to 34 mg/l methanol and was produced by sorption purification of the atmospheric condensate during a prolonged manned experiment.--Copyright 1976, Biological Abstracts, Inc.
W77-01602

CHLOROPHYLL DEGRADATION PRODUCT IN SEDIMENTS OF LAKE TEGA-NUMA, (IN JAPANESE),
S. Kobayashi, and O. Udagawa.
Jpn J Limnol 36(2), p 65-75, 1975.

Descriptors: *Chlorophyll, *Lake sediments, Asia, *Organic matter, *Biodegradation, Correlation analysis, *Spatial distribution, Phytoplankton.
Identifiers: Lake Tega-Numa(Japan).

Vertical distribution of the chlorophyll degradation product (phaeophytin), organic C, organic N and ignition loss in sediments of Lake Tega-numa (Japan) was studied. The content of phaeophytin was greater in the upper layers and decreased remarkably with core depth. The correlation was obtained between organic C and ignition loss, organic N and ignition loss and organic C and organic N. The values of the C/N ratio in sediments was 10-16 in the upper layers and 16-29 in the deeper layers. In the upper layers a correlation was observed between the C/N ratio and the contents of phaeophytin. The origin of organic substances in sediments of Lake Tega-numa is inferred to be phytoplankton in the upper layers and undecomposed plant matter in the deeper layers.
W77-01604

THE SPECIES, SIZE AND AGE COMPOSITION OF FISHES IN DONETS PART OF WARM WATER SEWAGE BY LUGANSK STATE REGIONAL ELECTRIC POWER STATION, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Zoologii.
A. Y. Shcherbukha.
Gidrobiol Zh., Vol. 9, No. 3 p 52-57, 1973.

Descriptors: *Fish populations, *Fish, *Inflow, *Growth stages, *Aquatic environment, *Thermal water, *Speciation, *Environemtal effects, Industrial pollution, Fishing, Warm-water fish, Ecotypes.
Identifiers: Severski y, Donets, Lugansk.

In the region of Northern Severskiy Donets, under influence of Lugansk SREP, USSR warm water inflow, immature stages of valuable fish species predominate, with a remarkable increase of mature stages in the non-valuable species yield. This is evidence of unfavorable environmental conditions for the former, and is convenient for the latter. Decrease in the number of fish species and their stock depend on both industrial pollution and overfishing.--Copyright 1974, Biological Abstracts, Inc.
W77-01608

DYNAMICS, STOCK AND FORECAST OF FISH CATCHES IN LAKES OF THE KURA-ARAKS LOWLAND, (IN AZERBAIJANI),
M. O. Akhmedov.
Izv Akad Nauk Az SSR Ser Biol Nauk. 4, p 80-83, 1974.

Descriptors: *Fish harvest, *Forecasting, *History, Lakes, Carp, Perches, Pikes.
Identifiers: Azerbaijan SSR, Bream, Dynamics, Kura-Araks, Roach, Sheatfish, USSR, Lake Adzhikabul, Lake Akgel, Lake Nakhalygchala.

Information is presented on the fish catches in lakes Adzhikabul, Akgel and Nakhalygchala of the Kura-Araks lowland in the Azerbaijan SSR (USSR) during the past 20 yr. The main causes of the decline in the catch of carp, sheatfish, perch-pike, bream and roach are indicated. A forecast of fish catches in the near future is given. By the end of 1977 it may be almost double the 1967-1972 catch.--Copyright 1975, Biological Abstracts, Inc.
W77-01609

COMPARATIVE HYDROECOLOGICAL AND ZOOLOGICAL INVESTIGATIONS IN SOME SUBMERGED PLANT STANDS OF LAKE VELENCE, (IN GERMAN),
Eotvos Lorand Univ., Budapest (Hungary). Inst. of Tiersystem.
For primary bibliographic entry see Field 2H.
W77-01658

RESPONSES OF PHYTOPLANKTON TO RENEWED SOLAR RADIATION IN A STRATIFIED INLET,
Fisheries and Marine Service, Nanaimo (British Columbia). Biological Station.
R. R. Parker, and J. Sibert.
Water Research, Vol. 10, No. 2, p 123-128, 1976. 5 fig, 14 ref, 3 tab.

Descriptors: *Phytoplankton, *Humus, *Pulp wastes, *Photosynthesis, *Water pollution effects, Humic acids, Water pollution sources, Wastes, Industrial wastes, *Canada, Foreign countries, Oxygen, Water pollution, Organic compounds, Effluents, Aquatic life.
Identifiers: *Alberni Inlet(British Columbia), Kraft mills.

The hypothesis that humic substances discharged by a pulp mill at the head of Alberni Inlet (British Columbia, Canada) was responsible for an oxygen deficiency by blocking sub-halocline photosynthesis was tested by two experimental methods. In the short term (4-5 hr), no production could be demonstrated using the carbon-14 method and exposing sub-halocline water to light. In the longer term, an intense phytoplankton bloom occurred after a 3-day lag period. It is concluded that removal of humic substances from the pulp mill effluent will result in renewed oxygen production below the halocline. (Witt-IPC)
W77-01659

CHEMISTRY OF WEST COAST GROUNDWOOD EFFLUENT TOXICITY,
MacMillan Bloedel Ltd., Vancouver (British Columbia).
M. Solinas, and E. W. Tunstall.
In: Canadian Wood Chemistry Symposium, September 1-3, 1976, Mont Gabriel, Quebec, Canada. Canadian Pulp and Paper Association, Montreal, Quebec, p 155-157. 3 fig, 4 ref.

Descriptors: *Pulp wastes, *Toxicity, Water pollution sources, Wastes, Industrial wastes, Effluents, Lethal limit, Water pollution effects, Canada, Pacific Coast Region, Hemlock trees, Phenols, Organic compounds.
Identifiers: *Groundwood mills, Western hemlock(Tsuga heterophylla), Hydroxymatairesinol, Alpha-conidendrin, Matairesinol, Conidendrins, Wood extractives.

Hydroxymatairesinol, alpha-conidendrin, and matairesionl were identified in the effluent of a Canadian West Coast groundwood mill. Hydroxymatairesinol was present in lethal concentration and was found to be a major contributor to the toxicity of groundwood effluents where western hemlock (Tsuga heterophylla) is the principal source of fiber. (Sykes-IPC)
W77-01668

COMPARATIVE STUDIES ON THE ISOLATION OF SALMONELLA FROM EFFLUENTS, (IN RUSSIAN),
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Lab. for Zoonoses.
For primary bibliographic entry see Field 5A.
W77-01691

THE EFFECT OF PARK USE ON SURFACE WATER QUALITY,
Max C. Fleischmann Coll. of Agriculture, Reno, Nev. Div. of Agricultural and Resource Economics.
C. T. K. Ching, and G. E. Frick.
Growth and Change, Vol. 5, No. 4, p 15-20, October 1974. 1 fig, 2 tab.

Descriptors: *Recreation, *Water quality, *Attitudes, *Parks, *Least squares method, Coliforms, Water temperature, Boating, Ecology, Dissolved oxygen, *New Hampshire, *State parks.
Identifiers: *Pawtuckaway State Park(NH).

Attitudinal surveys of residents and a water quality survey using samples from selected intervals across the lake and along the shore near swimming areas and shorelines inhabited by property owners were conducted in the Pawtuckaway State Park in southern NH to determine the impact of park use on water quality and on the perceptions of lakeshore residents regarding environmental quality. Water samples included the following variables: dissolved solids, pH, dissolved oxygen, clarity, temperature, coliform bacteria, alkalinity and ions. Attitudinal surveys were addressed to problems of boating, overcrowding, ecology, park-resident relations and property values. Water quality was found to be suitable for drinking for all factors except coliform bacteria. On some days coliform concentrations were low enough for recreational purposes; on other days concentrations exceeded the stringent standards set by the state of NH. Mean water quality did not vary significantly among sample points except for water temperature and sodium and potassium concentrations. Nine equations (therefore 9 indices) were fitted by least squares analysis, with only 5 having significant F statistics at 5% level. These were equations with dependent variables of water temperature, dissolved oxygen, chloride and potassium. Regression analysis could explain 70-75% of variance in water temperature and chloride concentration, and 60% of variance in dissolved oxygen, sodium and potassium. These results indicate variables other than climate and park use determine water quality. Although problems were expressed by lakeshore residents, the surveys revealed that residents do not believe park users are largely responsible for those problems. (Gentry-North Carolina)
W77-01692

BENEFICIAL USE OF THERMAL EFFLUENT IN LOBSTER CULTURE,
San Diego State Univ., Calif. Dept. of Biology.
R. F. Ford, J. C. Van Olst, J. M. Carlberg, W. R. Dorband, and R. L. Johnson.
Reprinted from Proceedings of the Sixth Annual Meeting, World Mariculture Society, Seattle, Washington, January 27-31, 1975, p 509-519, 1976. 3 tab, 12 ref.

Descriptors: *Aquiculture, *Lobsters, *Water quality, *Water pollution effects, *Thermal pollution, California, Temperature.
Identifiers: Thermal effluents, Lobster rearing, Warm water effects.

Comparative water quality analyses and rearing experiments were conducted to assess benefits and problems in using thermal effluent to culture the American lobster (Homarus americanus) from the egg to market size. Salinity, dissolved oxygen, pH, and concentrations of the heavy metals Cu, Zn, Cd, Co, Pb, Cr, and As were essentially the same in thermal effluent from the Encina Power plant as in ocean water from the outer Agua Hedionda Lagoon and Scripps. Sensitive H. americanus larvae employed to test effluent water quality were cultured individually and in mass rearing systems at constant temperatures of 18.5 and 21.6 C. Larvae reared to Stage IV in Encina effluent and in water from the two ocean sources did not differ significantly in survival or size attained. Similar results were obtained for larvae and juveniles reared to Stage VIII over a 3-month period at 22.1 C. These results suggest that chemical toxicity may not be a problem in using thermal effluent from the Encina Power Plant. Preliminary results indicate that thermal effluent may provide a useful and economical source of warm water for lobster culture. (NOAA)
W77-01707

ENVIRONMENTAL ASPECTS OF A LARGE TROPICAL RESERVOIR - A CASE STUDY OF VOLTA LAKE, GHANA.
Smithsonian Institution, Washington, D. C. Office of International and Environmental Programs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 630, Price codes: A16 in paper copy, A01 in microfiche. Prepared for the Agency for International Development, September 1974. P.H. Freeman, editor. 360 p. 8 fig, 16 tab, 260 ref, 4 append. AID/csd-2608.

Descriptors: *Impoundments, *Reservoirs, *Tropical regions, *Environmental effects, Geology, Hydrogeology, *Cycling nutrients, Plankton, Aquatic weed control, *Oligotrophy, Fisheries, Water supply, Human diseases, Biocontrol, Sedimentation, Seismic properties, Groundwater, Hydrologic aspects, Water balance, Bathymetry, Salinity, Irrigation, Waste assimilative capacity, Aquatic life, Storage capacity, Navigation, Vectors(Biological), Microclimatology, Electric power production.
Identifiers: *Volta Lake(Ghana), Case study.

The ecological and limnological effects of Volta Lake, an 8500 sq km impoundment on the Volta River in Ghana, were investigated to typify the environmental effects of tropical reservoirs. Comprehensive investigations covered the geology, seismic effects, groundwater, related hydrology, lake topography, water supply, and power generation capacity. Mineral cycling in this oligotrophic body of water was related to fish production, plankton, and aquatic weeds. Runoff nutrient sources are limited due to the poor soils of the region. The beneficial aspects of the aquatic weeds for fish production are contravened by inhibiting navigation and providing substrates for disease vectors. Ceratophyllum harbors Bulinus, the snail vector of urinary schistosomiasis, which is prevalent in 75% of the local populace. Biological control of weeds and the vectors of river blindness (Onchocerciasis), malaria, sleeping sickness (Trypanosomiasis) are evaluated. A mayfly (Povilla) is an effective control agent of Polygonum, a puffer fish may control Geratophyllum, a beetle (Atlica) attacks Ludwigia leptocarpa, a snail (Physa) and a moth (Tortrix) attack Pistia. The only current effective weed-clearing techniques are cutting, hoeing, and burning. The water supply of the lake is of potential importance to the estimated 100,000 persons who live in the vicinity. Wastewater is insignificant in water quality and the assimilative capacity for organic wastes is great. (Auen-Wisconsin)
W77-01779

WATER POLLUTION INVESTIGATION: ASHTABULA AREA,
Calspan Corp., Buffalo, N. Y.
P. M. Terlecky, J. G. Michalovic, and S. L. Pek.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 861, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-905/9-74-008, January 1975. 157 p. 5 fig, 40 tab, 65 ref, 3 append. EPA-68-01-1575.

Descriptors: *Water pollution, *Lake Erie, *Ohio, Industrial wastes, Water pollution control, Chlorine, Mercury, Water temperature, Dissolved solids, Metals, Biota, Water pollution effects, Water chemistry, Permits, Water quality standards, Biomass, Benthos, Monitoring, Pollutants, Conductivity, Coliforms, Waste dilution.
Identifiers: *Ashtabula River(Ohio), *Ashtabula Harbor(Ohio), *Fields Brook(Ohio), Flushing time.

Water quality and biota of the Ashtabula River and Harbor area in Lake Erie at Ohio were studied. An industrial complex discharging into Fields Brook since 1950 has seriously degraded water quality. Total residual chlorine, mercury, high temperatures, dissolved solids, and metals are the most serious pollutants affecting the area. Total residual chlorine ranged from 1-12 mg/l at the mouth of Fields Brook, and mercury values were 1.3-4.8 microgram/l. Dissolved solids were 1495-1612 mg/l, and conductivity was as high as 1850 micromhos/cm in Fields Brook. Calculations of flushing time for Ashtabula Harbor during low flow conditions indicated near stagnation in late summer. A 60-day flushing time for the harbor was postulated under present conditions. Diatoms and phytoplankton found in the harbor and lower river indicated the presence of an eutrophic, pollution tolerant type of community. An indigenous population was absent, suggesting toxic conditions. Low cell counts, biomass, and diversity plus dominance by only a few species at each sampling station indicated a seriously degraded water quality situation. If requirements of NPDES permits are fulfilled, improvement in water quality can be expected. Total residual chlorine, mercury, conductivity, and dissolved solids should be monitored for the next two years. (Buchanan-Davidson--Wisconsin)
W77-01780

PROCEEDINGS OF THE FIRST MICROBIOLOGY SEMINAR ON STANDARDIZATION OF METHODS, JANUARY 9-11, 1973, SAN FRANCISCO, CALIFORNIA.
Environmental Protection Agency, Washington, D.C. Office of Research and Monitoring.
For primary bibliographic entry see Field 5A.
W77-01781

SUBTIDAL CONCRETE PILING FAUNA IN MONTEREY HARBOR, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 5A.
W77-01783

EFFECTS OF SUSPENDED SOLIDS ON SELECTED ESTUARINE PLANKTON,
Maryland Univ., Solomons. Natural Resources Inst.
J. A. Sherk, J. M. O'Connor, and D. A. Neumann.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-022 653, Price codes: A04 in paper copy, A01 in microfiche. Corps of Engineers, Ft. Belvoir, Virginia, Coastal Engineering Research Center Report No. MR 76-1, January 1976. 50 p. 12 fig., 4 tab., 35 ref., 1 append. G31266. DACW 72-71-C-0003.

Descriptors: *Suspended solids, *Phytoplankton, *Zooplankton, *Photosynthesis, *Feeding rates, Dredging, Copepods, Laboratory tests, Chlorella, Sediment load, Water pollution effects, Estuarine environment.
Identifiers: Eurytemore affinis, Acartia tonsa, Monochrysis lutheri, Nanochloris, Stichococcus.

Laboratory studies of the effects on phytoplankton photosynthesis of suspended mineral solids and resuspended natural sediments, generated by dredging, in cultures of Monochrysis lutheri, Nannochloris, Stichococcus, and Chlorella are described. Also investigated were the effects of

the suspended load on the feeding activity of the calanoid copepods Eurytemora affinis and Acartia tonsa. The experimental suspended sediment concentrations were typical of those found in estuarine systems during flooding, storm agitation, dredging and dredged-material disposal. Addition of fine silica sand to cultures of these common phytoplankton reduced their carbon assimilation by 50 to 90%, probably by light attenuation. Suspensions, in various concentrations, of Fuller's earth, fine silica sand, or natural sediments caused reductions in the copepod feeding rates. Concentrations greater than 250 mg/l caused reductions in the ingestion of labeled M. lutheri by the copepods. Evidently nonselective feeding exists at high particle densities in these zooplankton. The results of reduced consumption of food particles, if continued over a sufficiently long period, could cause a break in the food chain. However, these experiments cannot be used to predict the exposure time required to cause serious population depletion, as they were designed to measure feeding rates only. (Auen-Wisconsin)
W77-01784

WATER POLLUTION INVESTIGATION: GENESEE RIVER AND ROCHESTER AREA,
O'Brien and Gere Engineers, Inc., Syracuse, NY.
P. E. Moffa, C. B. Murphy, and D. A. MacArthur.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 489, Price codes: A11 in paper copy, A01 in microfiche. Report No. EPA-905/9-74-016, January 1975. 244 p. 53 fig., 25 tab., 86 ref., 3 append. 68-01-1574.

Descriptors: *Rivers, *Water pollution effects, *Water pollution sources, *Dissolved oxygen, *New York, River flow, Projections, Runoff, Computer programs, Chemical properties, Physical properties, Plankton, Fish, Benthos, Oxygen demand, Waste treatment, Industrial wastes, Municipal wastes, Lake Ontario, *Waste assimilative capacity, Model studies, Water quality standards, Water pollution control, Oxygen sag.
Identifiers: *Genesee River(NY), Rochester(NY).

Treatment extended beyond the secondary level for municipal discharges and Best Practicable Control Technology Currently Available for industrial discharges will not significantly improve the level of dissolved oxygen in the Genessee River, according to assimilation capacity modeling generated by a water quality study of pollution impacts on the river in Monroe County, New York at its point of entrance into Lake Ontario. Four major point discharges and three non-point sources have a significant effect on dissolved oxygen levels. Point sources are Oatka Creek, the Barge Canal, the Gates-Chili-Ogden sewage treatment plant and the Kodak Company wastewater treatment plant. These discharges are especially significant in relation to dissolved oxygen, carbonaceous and nitrogenous ultimate oxygen demand load, and minimum average seven consecutive day flow conditions. Non-point source effects on dissolved oxygen levels are contributions from cultivated and forested upstream areas of the drainage basin, benthic demand exerted in the lower six miles of the river, and horizontal dispersion effects in the river's lower reaches caused by the influence of Lake Ontario. (Harris-Wisconsin)
W77-01785

WATER POLLUTION INVESTIGATION: BUFFALO RIVER,
Versar, Inc., Springfield, Va. General Technologies Div.
D. H. Sargent.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 590, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-905/9-74-010, February 1975. 161 p. 13 fig., 41 tab., 66 ref., 6 append. 68-01-1569.

Descriptors: *Water pollution control, *Water pollution sources, *Rivers, *Great Lakes, *Projections, River flow, Flow rates, Water level fluctuations, Mixing, New York, Water quality standards, Tributaries, Sewage effluents, Pollutants, Industrial wastes, Mathematical models, Computer programs, Iron, Biochemical oxygen demand, Dissolved oxygen, Oxygen sag, *Waste assimilative capacity, Abiotic environment, Waste treatment.
Identifiers: *Buffalo River(NY), VERWAQ Computer program, Waste effluent standards, Cayuga Creek(NY), Niagara River(NY).

Present and projected waste loadings and water quality in the Buffalo River in western New York State were evaluated under terms of the 1972 United States-Canada Great Lakes Water Quality Agreement. Of 26 parameters studied, most showed evidence of poor water quality. In one parameter, the combination of low water velocities, high water temperatures and high waste loadings resulted in a summertime dissolved oxygen concentration of less than 1 mg/l and an almost complete absence of bottom organisms. The iron content levels were found to contravene accepted standards. Three independent observations confirmed that the industrialized section of the Buffalo River is a well-mixed body of water. Utilizing a water quality simulation model developed and verified in the study, projections were made for future water quality upon implementation of the Best Practicable Control Technology Currently Available, (BPCTCA). A post-BPCTCA projection showed that water quality standards would be marginally met for temperature and dissolved oxygen, but that more-stringent waste allocations would be needed for iron content. After BPCTCA, the dominant water quality achievement constraint in the river would be the oxygen-demanding waste load of the basin's combined sewer overflows. (Harris-Wisconsin)
W77-01786

NATIONAL EUTROPHICATION SURVEY METHODS 1973-1976.
National Environmental Research Center, Las Vegas, Nev. Monitoring Applications Lab.
For primary bibliographic entry see Field 5A.
W77-01787

NATIONAL EUTROPHICATION SURVEY: DATA ACQUISITION AND LABORATORY ANALYSIS SYSTEM FOR LAKE SAMPLES,
Environmental Monitoring and Support Lab., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W77-01788

BENTHIC NUTRIENT REGENERATION AND ITS COUPLING TO PRIMARY PRODUCTIVITY IN COASTAL WATERS,
Woods Hole Oceanographic Institution, Mass.
G. T. Rowe, C. H. Clifford, and K. L. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-022 726, Price codes: A02 in paper copy, A01 in microfiche. Nature, Vol. 225, p. 215-217, May 15, 1975. (Report No. WHOI-76-25, March 1976. 5 p.) 2 fig., 1 tab., 19 ref. NR 083-004. N00014-66-C-0214; DES-74-22339.

Descriptors: *Cycling nutrients, *Nitrification, *Oceans, *Shallow water, *Primary productivity, Bottom sediments, Continental shelf, Nitrogen, Atlantic Ocean, New York, Benthos, Decomposing organic matter.
Identifiers: *New York Bight.

The high primary productivity of coastal ocean waters is attributed to nitrogen regeneration from continental shelf sediments. In situ measurements in the New York Bight of the rate at which ammonia and nitrate diffuse into the water column from sediments were based on the assumption that the breakdown of organic matter in sediments is proportional to the amount of oxygen required. Thus for each milliter of oxygen consumed, 0.412 mg organic carbon is oxidized to carbon dioxide. Because the organic carbon-nitrogen ratio in sediments is about 10:1 or greater, it was construed that 0.041 mg organic nitrogen would be remineralized to ammonia for each milliliter of oxygen consumed. Both the sediment oxygen demand and ammonia production were highly dependent on temperature. Most of the nitrogen at warmer temperatures was in ammonia form; at lower temperatures nitrogen may be lost by denitrification to elemental nitrogen. When the bottome respiration on the continental shelf is approximately 10-20 ml/sq m/hr 4.12 mg organic carbon and 0.412 mg organic nitrogen would be oxidized to carbon dioxide or deaminated to ammonia. If about 80% of the ammonia were released from the sediment the average feedback would be about 23.5 microgram-atom nitrogen/sq m/hr. The high ammonia concentrations were not due to advection from offshore waters or from Hudson River effluent. (Auen-Wisconsin)
W77-01789

RELATIONSHIPS BETWEEN ZOOPLANKTON DISPLACEMENT VOLUME, WET WEIGHT, DRY WEIGHT, AND CARBON,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W77-01790

A NOTE ON STANDING CROPS OF SPARTINA ALTERNIFLORA IN TEXAS AND FLORIDA,
Louisiana State Univ., Baton Rouge. Dept. of Marine Science.
R. E. Turner, and J. G. Gosselink.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 376, Price codes: A03 in paper copy, A01 in microfiche. Marine Science, Vol. 19, p. 113-118, 1975. (Report No. LSU SG-75-004). 2 fig., 3 tab., 18 ref. NOAA 04-5-158-12; DACW-39-73-C-0108.

Descriptors: *Aquatic plants, *Salt marshes, *Standing crops, *Texas, *Florida, Productivity, Gulf of Mexico, Estuarine environment.
Identifiers: *Spartina alterniflora, Cord grass.

The productivity of cord grass (Spartina alterniflora) was measured at eight Gulf Coast sites, from Brownsville, Texas to Tampa, Florida. The predicted biomass of live Spartina at the sites sampled, average weight of individual mature, young, and dead stems, and the live:dead ratio are computed. The late summer biomass of live material seems comparable to that on the East coast but it appears to decrease at the extremes of its range. The influence of tidal amplitude is discounted, but tidal energy is probably influential in physically fragmenting dead vegetation and the low energy regime of the Gulf Coast would partially explain the greater proportion of dead material in these marshes relative to Georgia. The weight of dead culms is only 50-75% of the weight of mature live culms, an indication that 25-50% of live organic weight is lost just before or soon after death, either by translocation to the roots, by leaching, or by decomposition of the above ground material. Compared to the North Atlantic coast, biomass along the Gulf Coast increases more for equal increments of height. The differences are attributable to variations in weight of individual culms, in stem density at different sites, and in the heavier per unit length of the culms. (Auen-Wisconsin)
W77-01792

PRE-IMPOUNDMENT BIOLOGICAL SURVEY OF STOCKTON RESERVOIR-SAC RIVER, MISSOURI, AUGUST 1968,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Field Investigations Branch.
N. A. Thomas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 740,

Price codes: A02 in paper copy, A01 in microfiche. 1969. 9 p. 1 fig., 1 tab.

Descriptors: *Baseline studies, *Pre-impoundment, *Benthic fauna, *Missouri, Rivers, Varieties, Aquatic insects, Upstream, Downstream, Eutrophication.
Identifiers: *Sac River(Mo), Stockton Reservoir(Mo).

The populations inhabiting the headwaters of the Sac River were at least 50% pollution-sensitive stoneflies, mayflies and caddisflies. Slightly organically enriched Turkey Creek supported the largest populations (426 organisms/sq ft) of pollution-sensitive bottom animals but containing 27% sludgeworms. The reach of the Little Sac River that will be inundated supported 392 organisms/sq ft of benthic fauna comprising of 9% pollution-sensitive species. The number of bottom animals increased from 26 to 287 organism/sq ft and from 9 to 11 kinds in the 5-mile reach downstream from the Stockton Dam. Pollution-sensitive forms made up 39% and 52% of the population one-half mile and 5 miles downstream from the dam, respectively. Pollution-tolerant forms made up 46% and 42% of the populations respectively. Algal nuisances might develop in the reservoir because all the inflowing water contains in excess of 90 micrograms/l of total phosphorus. The inorganic nitrogen and total phosphorus concentrations in Little Sac River were 1.7 mg/l and 560 microgram/l, respectively. Downstream populations will probably improve as the result of higher water quality that will be discharged from the reservoir. (Auen-Wisconsin)
W77-01793

BIOLOGICAL INVESTIGATIONS OF TUTTLE CREEK RESERVOIR, KANSAS,
Federal Water Pollution Control Administration, Cincinnati, Ohio. Field Investigations Branch.
N. A. Thomas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 782, Price codes: A02 in paper copy, A01 in microfiche. Report 1969. 18 p. 5 fig., 1 tab., 5 ref.

Descriptors: *Reservoirs, *Rivers, *Post-impoundment, *Benthic fauna, Physical properties, Chemical properties, *Kansas, Dissolved oxygen, Suspended solids, Light penetration, Euphotic zone, Primary productivity, Aquatic insects, Downstream, Upstream, Varieties.
Identifiers: *Big Blue River(Kan), Tuttle Creek Reservoir(Kan).

Surveys conducted in 1965, three years after inundation, and 1968 indicated that the productivity of the Big Blue River in Kansas had not increased as the results of impounding Tuttle Creek. The number of algae in Tuttle Creek Reservoir was always less than that observed upstream because of the restricted euphotic zone due to the 6,629,000 tons of sediments introduced annually and consequent turbidity. In the upstream reach of the reservoir primary production was measured at 1310 and 800 mg C/cu m/day in 1966 and 1968, respectively; further downstream, primary production was reduced from 900 to 240 mg C/cu m/day. With the exception of winter, algal counts were low because of reduced light penetration and adherence of silt to algal cells causing their premature settling. Phosphorus concentrations decreased as the water passed through the reservoir; 80% of the phosphorus in the reservoir was in soluble form, indicating that there was little phosphorus utilization by algae. Both species diversity and numbers of bottom organisms increased upstream after impoundment, with 80% typical of clean water. A desirable population of benthic fauna had not developed downstream in the Big Blue River because of an inadequate food supply, excess siltation, and decreases in water velocity. Benthic fauna in the reservoir had also declined. (Auen-Wisconsin)
W77-01794

SUSPENDED SEDIMENT DETERMINATION IN ESTUARINE WATERS FROM PHOTOMETER AND SECCHI DISC MEASUREMENTS,
Naval Academy, Annapolis, Md.
For primary bibliographic entry see Field 5A.
W77-01795

LIMNOLOGICAL STUDIES OF FLATHEAD LAKE, MONTANA: A STATUS REPORT,
Montana Univ., Missoula. Dept. of Biology.
A. R. Gaufin, G. W. Prescott, and J. F. Tibbs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 445, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/3-76-039, April 1976. 92 p, 6 fig, 18 tab, 75 ref, 1 append. 1-F1-WP-26, 212-1-4.

Descriptors: *Limnology, *Oligotrophy, Montana, Algae, Cyanophyta, Diatoms, *Montana, Chlorophyta, Chrysophyta, Pyrrophyta, Euglenophyta, Dominant organisms, Limiting factors, Varieties, Physical properties, Chemical properties, Water temperature, Aquatic weeds, Rotifers, Zooplankton, Daphnia, Temporal distribution, Spatial distribution, Trout, Rotifers, Copepods, Salmon, Crustaceans, Fish populations.
Identifiers: *Flathead Lake(Mont), Bacillariophyceae, Xanthophyceae, Cryptophyta, whitefish.

Flathead Lake is a dimictic oligotrophic lake. The algal flora is classified as a Diatom-Cyanophyte moderately hardwater type and contains 102 Chlorophyta species, 40 Cyanophyta species, 12 Chrysophyceae species, 399 Bacillariophyceae species and varieties in 42 genera, 13 Pyrrophyta species, 4 Xanthophyceae species, 1 Euglenophyta species, and 2 Cryptophyta species. Nitrate and phosphate concentrations are relatively low but are occasionally high enough to support blue-green algal blooms, indicating gradual eutrophication in restricted areas. Low temperatures and low concentrations of organic acids and vitamins are deterrents to extensive blooms. The more common forms of zooplankton found are Daphnia species, Kellicottia longispina, Keratella cochlearis, Cyclops bicuspidatus thomasi, and Diaptomus ashlandi. Spatial and temporal distribution of Daphnia appears to be influenced primarily by temperature. A total of 8,912 fish were collected between November 1967-December 1971 consisting of 15 major species: lake whitefish, Kokanee salmon, Dolly Varden, and Lake trout were the most common game species. The future of the Flathead Lake fishery depends on natural reproduction in its waters and the quality of the aquatic habitat. Water development projects, housing projects, lumbering, and natural environmental variations will all be reflected in fish populations of this drainage system. (Buchanan-Davidson--Wisconsin)
W77-01796

DEGRADATION OF PESTICIDES BY ALGAE,
Alabama Univ., University. Dept. of Biology.
J. C. O'Kelley, and T. R. Deason.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 933, Price Codes: A04 in paper copy, A01 in microfiche. Report EPA-600/3-76-022, March 1976. 48 p. 13 tab., 48 ref. R-800371.

Descriptors: *Biodegradation, *Pesticides, *Algae, Sorption, Phytotoxicity, *Alabama, Diazinon, Dieldrin, Pesticide toxicity, Endrin, Heptachlor, Inhibitors, Pesticide residues.
Identifiers: *Black Warrior River(Ala), Atrazine, Methoxychlor, 2,4-DBE, Carbaryl, Malathion, Captan, Toxaphene.

Interactions of twelve pesticides with 37 fresh water algae collected from the Black Warrior River, Alabama, were studied to determine variability in algal responses to pesticides. Sensitivity to pesticides varied with different algae, thus estimates of environmental damage to fresh water flora can be erroneous if based on laboratory strains. Algae used should be representative of algae native to particular aquatic environments. Atrazine was the most toxic to the river algae: some more sensitive than previously reported. Sorption of methoxyclor, 2,4-dichlorophenoxyacetic acid, butoxy ethyl ester (2,4-DBE), and carbaryl varied with different species. C14-methoxychlor adsorbed by algae was rapidly exchanged with unlabeled methoxychlor, indicating that uptake was largely due to physical adsorption to cell surfaces. Some algal strains lack binding sites for 2,4-DBE thus sorption is undetectable. The long lag in C14-carbaryl uptake by some algae suggested that breakdown products, not the parent pesticides, were adsorbed. It is stressed that generalizations about pesticide uptake by algae may cause errors in estimating environmental effects of such uptake. Biological breakdown of malathion by algae can occur in light. Some algae can degrade methoxychlor and 2,4-DBE even if not absorbed. (Buchanan-Davidson--Wisconsin)
W77-01797

CHLOROPHYLL-A AND PRIMARY PRODUCTION IN GEORGIAN BAY, NORTH CHANNEL, AND LAKE HURON, APR. TO DEC. 1974,
Canada Centre for Inland Waters, Burlington (Ontario).
N. H. F. Watson, L. R. Culp, and H. F. Nicholson.
Canada Fisheries and Marine Service Technical Report No. 600, 1976. 47 p. 18 fig., 6 tab., 10 ref.

Descriptors: *Primary productivity, *Chlorophyll, *Lake Huron, Carbon, Photosynthesis, Trophic level, Carbon radioisotopes, *Canada, Lakes, Great Lakes, *Oligotrophy, *Mesotrophy.
Identifiers: Georgian Bay(Lake Huron), North Channel(Lake Huron).

The trophic status of Georgian Bay is between that of Lake Superior on the oligotrophic end of the scale and Lake Huron and North Channel at the mesotrophic end, according to comparative computations made from chlorophyll-a and carbon-14 uptake measurements made during seven cruises in Georgian Bay, North Channel and the northernmost portion of Lake Huron during 1974. Annual primary production estimates were computed from the chlorophyll-a and carbon uptake measurements and a trophic range was established on the basis of comparisons made with other recent studies. In Georgian Bay, cruise means of corrected chlorophyll-a ranged from 0.7 micrograms/1 to 1.7 micrograms/1. The range in North Channel was 1.3 micrograms/1 to 2.3 micrograms/1 and in Lake Huron, 1.0 micrograms/1 to 2.3 micrograms/1. Annual primary productivity for Georgian Bay was estimated at 76 grams C/sq m/yr, using the mean uncorrected chlorophyll-a value, and 35 grams C/sq m/yr, using carbon-14 cruise means extended to zero winter values. For North Channel, the respective estimates were 92 grams C/sq m/yr and 37 grams C/sq m/yr; the Lake Huron estimate from uncorrected chlorophyll-a value alone was 92 grams C/sq m/yr. (Harris-Wisconsin)
W77-01798

SEASONAL ABUNDANCE AND HORIZONTAL DISTRIBUTION OF PLANKTONIC CRUSTEACEA OF GEORGIAN BAY,
Canada Centre for Inland Waters, Burlington (Ontario).
J. Carter.
Canada Fisheries and Marine Service Technical Report No. 588, 1975. 27 p. 9 fig., 3 tab., 4 ref.

Descriptors: *Plankton, *Crustaceans, *Biological communities, Population, Dominant organisms, *Phosphorus, *Lake Huron, Copepods, *Canada, Distribution, *Temporal distribution, *Spatial distribution, Varieties, *Chlorophyll, *Eutrophication.

Identifiers: Cyclops bicuspidatus thomasi, Georgian Bay(Lake Huron), North Channel(Lake Huron).

A study of the density of planktonic crustacea and of the relationship between crustacean density, phosphorus loading and surface chlorophyll-a indicates that the eutrophication level for Georgian Bay is lower than that of Lake Huron but slightly higher than for Lake Superior. Samples were periodically collected May-December 1974 at 46 stations in Georgian Bay and North Channel. Species composition, abundance and seasonal and horizontal distribution were analyzed. Eleven cladocerans and 12 copepods were identified; among the latter, Cyclops bicuspidatus thomasi comprised more than 50% of all planktonic crustacea. Abundance of cladocera, cyclopoid copepods and calanoid copepods was greatest in midsummer, with a secondary copepod peak in December. Patalas observed (1972) that planktonic crustacea density in the Great Lakes is positively related to lake-average chlorophyll-a concentrations, which is in turn positively related to the total annual phosphorus loading for each lake. Taking into account horizontal distribution variances for the planktonic crustacea, and considering the isolation of Georgian Bay and North Channel from Lake Michigan outflows, comparisons can be made with animal concentrations previously found by Patalas in Lake Superior and Lake Huron. (Harris-Wisconsin)
W77-01799

A PRELIMINARY REPORT ON THE BENTHIC MACROINVERTEBRATES OF GEORGIAN BAY AND NORTH CHANNEL,
Canada Centre for Inland Waters, Burlington (Ontario).
C. C. Loveridge, and D. G. Cook.
Canada Fisheries and Marine Service Technical Report No. 610, 1976. 53 p. 18 fig., 8 tab., 13 ref., 6 append.

Descriptors: *Lake Huron, *Benthic fauna, *Dominant organisms, Oligochaetes, Invertebrates, Distribution patterns, Lake sediments, Ecological distribution, Nematodes, Biological communities, Standing crops, Diptera, Biomass, *Canada.
Identifiers: *Georgian Bay(Lake Huron), *North Channel(Lake Huron), Pontoporeia affinis, Sphaeriids.

Three major trends are indicated from a benthological investigation of Georgian Bay and North Channel of Lake Huron. (1) Benthic populations in both bodies of water are greater in zones closest to the northern and northwestern shores; (2) macroinvertebratic abundance increases positively with reduced depth in these waters; and (3) faunal abundance is greater in coarse-grained sediments than in fine-grained ones. Benthos samples were collected during September 1973 from 111 of 121 stations in Georgian Bay and from 53 of 55 stations in North Channel. Findings in Georgian Bay included 51% Pontoporeia affinis, 20% Nematoda, 13% Sphaeriidae, 12% Oligochaeta and 3% Chironomidae. In North Channel the percentages for these fauna were 48% P. affinis, 18% Sphaeriidae, 15% Nematoda, 11% Oligochaeta, and 2% Chironomidae, with 6% miscellaneous taxa. Mean biomass was computed at .542 g/sq m in North Channel and .367 g/sq m in Georgian Bay. Little significant difference was found in the biomass composition percentages for all the important benthic macroinvertebrates in the two bodies of water. (Harris-Wisconsin)
W77-01800

A PRELIMINARY REPORT ON THE BENTHIC MACROINVERTEBRATES OF LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington (Ontario).
D. G. Cook.
Canada Fisheries and Marine Service Technical Report No. 572, 1975. 52 p, 11 fig., 2 tab., 26 ref., 2 append.

Descriptors: *Lake Superior, *Ecological distribution, *Benthic fauna, Oligochaetes, Diptera, Invertebrates, Distribution patterns, Lake sediments, Nematodes, Dominant organisms, Standing crops, Biomass, Benthos.
Identifiers: Pontoporeia affinis, Sphaeriids.

Possible ecological danger from mining activities on the northwest shore of Lake Superior is implied at the extreme western basin of the lake, based on a paucity of fauna found there during a lake-wide benthological investigation in April-May 1973. Four major trends were found: (1) benthic populations were greatest in the eastern lake waters, with relatively high density in Whitefish Bay; (2) benthic abundance generally correlated negatively with depth; (3) faunal abundance was correlated negatively with sedimentary organic carbon content; and (4) greater abundance of fauna was found in coarse-grained sediments than in fine-grained ones. A lake-wide estimate of the total macrobenthos in Lake Superior, based on a uniform grid pattern of about 400 stations, is 525/sq m, composed of 34% Pontoporeia affinis, 26% Oligochaeta, 32% Nematoda, 6% Sphaeriidae and 3% Chironomidae. Most of the Oligochaeta are Stylodrilus heringianus and Mesechytraeus. Nine major regions of Lake Superior were differentiated, with zones drawn to minimize population size and composition variation. (Harris-Wisconsin)
W77-01801

ALGAL ASSAYS: DEVELOPMENT AND APPLICATION,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
T. E. Maloney, and W. E. Miller.
American Society for Testing and Materials Special Technical Publication 573, p. 344-355, 1975. 8 fig., 2 tab., 5 ref.

Descriptors: *Bioassay, *Water analysis, *Algae, Testing procedures, Laboratory tests, Eutrophication, Nitrilotriacetic acid, Nutrients, *Pollutant identification, *Analytical techniques.
Identifiers: Bottle test, Chemostat test.

Descriptions are given of the development of algal assays in evaluating eutrophication. Testing methods and results of various laboratory algal assays are reviewed. The influence of nitrilotriacetic acid (NTA) on eutrophication was evaluated, with results indicating that NTA has no stimulatory effect on algal growth. Uses of assays are shown in their application to determination of algal growth-limiting nutrients, measurement of nutrient status and algal sensitivity to nutrient changes, to the evaluation of effects of changes in waste treatment processes on receiving waters, and to the assessment of materials and products to determine their potential effects on algal growth. Three fundamentally-different kinds of procedures are reviewed, analyzed and compared: the static bottle test, the continuous-flow chemostat test and the in-situ test. Data is given on the chemical content of various bodies of fresh water, along with data on algal growth stimulation achieved by restoring phosphorus to tertiary waste water. (Harris-Wisconsin)
W77-01803

1975 ANNUAL REPORT OF THE FRESHWATER BIOLOGICAL INVESTIGATION UNIT.
Northern Ireland Dept. of Agricultural, Antrim.
(1975). 19 p. 7 fig., 6 tab.

Descriptors: *Eutrophication, *Runoff, Europe, Urban runoff, Forest management, Agricultural runoff, Zooplankton, *Bioassay, Feed lots, Farm wastes, Oxygen sag, Phosphorus compounds, Nitrogen compounds, Trace elements, *Pollutant identification.
Identifiers: *Lough Neagh(N Ireland).

The use of algal isolates for bioassay work to identify limiting factors in the growth of algae, lead to a preliminary observation that algal growth in mountain lakes and reservoirs is not limited by the availability of trace metals, is among the results of studies ongoing since 1968 on algal blooms in Lough Neagh and other freshwater bodies in Northern Ireland. Results of certain studies indicate that phosphorus is a critical nutrient and that it limits the production of algae in the lake. Regression analysis of areal loadings of nitrogen and phosphorus from rivers that feed Lough Neagh indicates a significant correlation between soluble ortho-P loadings and the human population density of the basin catchments. However, particulate-P and nitrogen loadings do not correlate with human population density. Other research conducted by the Freshwater Biological Investigation unit included surveys of farm streams in which point-source pollution was identified, and an investigation of water loadings in a residential district. (Harris-Wisconsin)
W77-01804

CHEMISTRY OF NEARSHORE SURFICIAL SEDIMENTS FROM SOUTHEASTERN LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
R. Rossmann.
Special Report No. 57. 1975. 67 p. 45 fig., 6 tab., 17 ref., 3 append.

Descriptors: *Lake sediments, *Lake Michigan, *Metals, *Chemical properties, *Mineralogy, Nuclear powerplants, Silicates, Carbonates, Organic matter, Iron, Distribution, Calcium, Carbon, Cobalt, Chromium, Copper, Potassium, Magnesium, Manganese, Molybdenum, Nickel, Sodium, Phosphorus, Strontium, Zinc, Oxidation reduction potential, Hydrogen ion concentration, Tributaries, *Michigan, Littoral, Barium.

Three small streams discharging into Lake Michigan south of the Donald C. Cook nuclear plant near St. Joseph, Michigan have profoundly increased surficial sediment concentrations of numerous carbonates and other chemical compounds, according to an analysis of sediment samples collected offshore of the facility. A further conclusion is that construction of the plant's intakes and discharges may have altered the surficial sediment chemistry offshore of the plant. A collection was made of 158 sediment samples which were analyzed for 22 variables; including insolubility, loss on ignition, and measurements of various carbons, and other minerals. According to areal distribution maps, correlation coefficients and factor analysis, the carbonates are the dominant compound and control the chemistry of the sediments. But iron and organic compounds are the most chemically-active components capable of adsorption, desorption, precipitation and other trace metal concentration processes. Effects of the stream discharge into the lake near the plant is traceable through such variables as carbon, organic carbon and phosphorus. A suggestion calls for any monitoring of sediments for the impact of plant discharges to be done in areas of high iron, manganese, organic carbon or clay mineral content, where accumulation and concentration of radioactive isotopes to be released to the lake by the plant are considered most likely. (Harris-Wisconsin)
W77-01805

THE DEMONSTRATION AND STANDARDIZATION OF A METHOD FOR MONITORING THE ECOLOGICAL EFFECTS OF MARINE WASTE DISCHARGES.
Biome Co., Inc., Surfside, Calif.
For primary bibliographic entry see Field 5A.
W77-01806

WATER QUALITY BASELINE ASSESSMENT FOR CLEVELAND AREA--LAKE ERIE. VOL. II - THE FISHES OF THE CLEVELAND METROPOLITAN AREA INCLUDING THE LAKE ERIE SHORELINE,
John Carroll Univ., Cleveland, Ohio. Dept. of Biology.
A. M. White, M. B. Trautman, E. J. Foell, M. P. Kelty, and R. Gaby.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 747, Price Codes: A09 in paper copy, A01 in microfiche. Report No. EPA-905/9-75-001, February 1975. 193 p. 43 fig., 12 tab., 163 ref. EPA G005107.

Descriptors: *Water quality, *Lake Erie, *Fish populations, *Baseline studies, Habitat improvement, Water pollution, Varieties, History, Fish conservation, Rivers, Silting, Spawning, Fish migration, Dams, Dredging, Fish reproduction, Littoral, Economic impact, Rough fish, Erosion control, *Ohio.
Identifiers: *Cleveland(Ohio), Chagrin River(Ohio), Cuyahoga River(Ohio), Rocky River(Ohio), Fish species diversity.

Lake Erie fish populations close to the Cleveland Metropolitan Area are under stress from the degradation of the ecosystem and the stress varies significantly within the study area. The most highly distressed area is the lower 7 miles of the Cuyahoga River. All fish fauna in the nearshore waters of Lake Erie and the Three Rivers Watershed were investigated in 1971-74. The 86 species now inhabiting the waters are markedly different from the 107 species in the same waters in earlier time periods. Species changes and fish population declines are attributed to stream obstruction, pollution, siltation, loss of aquatic vegetation and other causes. The species composition has changed from one of highly-valuable food species and clean-water forms--such as muskellunge, walleye and lake trout--to a predominance of low food value species such as goldfish, carp, yellow perch and gizzard shad. The decline is traceable to a historical sequence dating back at least to 1840. The recovery of most of the species to abundant levels is possible through recommended pollution abatement and habitat restoration measures. (Harris-Wisconsin)
W77-01807

ENTERIC VIRUS SURVIVAL IN PACKAGE PLANTS AND THE UPGRADING OF THE SMALL TREATMENT PLANTS USING OZONE,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5D.
W77-01809

DILUTION FOR EUTROPHICATION CONTROL IN MOSES LAKE: HYDRAULIC MODEL STUDY,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-01814

ON-LINE SURVEILLANCE OF INDUSTRIAL EFFLUENTS EMPLOYING CHEMICAL-PHYSICAL METHODS OF FISH AS SENSORS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W77-01823

RECREATIONAL REUSE OF MUNCIPAL WASTEWATER -- PHASE II,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5D.
W77-01824

ABUNDANCE AND SEASONAL DISTRIBUTION OF MARINE MAMMALS IN THE GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01827

PHYTOPLANKTON AND PRIMARY PRODUCTIVITY IN THE NORTHEAST GULF OF ALASKA,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 6G.
W77-01849

THE DISTRIBUTION, ABUNDANCE, DIVERSITY, AND PRODUCTIVITY OF BENTHIC ORGANISMS IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01855

FOOD AND FEEDING RELATIONSHIPS IN THE BENTHIC AND DEMERSAL FISHES OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01857

PREPARATION OF ILLUSTRATED KEYS TO SKELETAL REMAINS AND OTOLITHS OF FORAGE FISHES - BERING SEA AND GULF OF ALASKA,
Alaska Univ., College.
For primary bibliographic entry see Field 6G.
W77-01858

PREPARATION OF ILLUSTRATED KEYS TO SKELETAL REMAINS AND OTOLITHS OF FORAGE FISHES - BEAUFORT SEA,
Alaska Univ., College.
For primary bibliographic entry see Field 6G.
W77-01859

LITERATURE SEARCH ON THE DENSITY AND DISTRIBUTION OF FISHES OF THE BEAUFORT SEA,
Alaska Univ., College.
For primary bibliographic entry see Field 6G.
W77-01860

ALASKA MARINE ICHTHYOPLANKTON KEY,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 6G.
W77-01861

LITTORAL SURVEY OF THE BEAUFORT SEA,
Western Washington State Coll. Bellingham.
For primary bibliographic entry see Field 6G.
W77-01862

BEAUFORT SEA PLANKTON STUDIES,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 6G.
W77-01863

THE PHYSIOLOGICAL EFFECT OF ACUTE AND CHRONIC EXPOSURE TO HYDROCARBONS OF PETROLEUM ON THE NEAR-SHORE FISHES OF THE BERING SEA,
Scripps Institution of Oceanography, La Jolla, Calif.
A. L. De Vries.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 1-14, April 1976. 1 fig, 5 tab, 6 ref. 03-5-022-86.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold region, *Toxicity, *Oil pollution, *Physiological ecology, Continental Shelf, Alaska, Aromatic compounds, Antifreeze, Sculpins.
Identifiers: *Outer Continental Shelf, *Petroleum resources, *Oil exploration, *Oil development, *Aromatic hydrocarbons, *Crude oils, Bering Sea, Hydrocarbons, Near shore fishes, Naphthalenes, Cod, Flounders, Liopsetta, Eleginus, Myoxocephalus, Megalocottus, *Protein synthesis.

Toxicity data for exposure to water soluble hydrocarbons on a few Bering Sea fishes are presented. The temperature of exposure appears to have profound effect. At low temperatures the hydrocarbons appear to be less toxic. Baseline measurements of oxygen consumption both at the organismal and tissue level reveal that the Bering Sea fishes are similar to other cold water fishes in regards to their physiology. Studies of the levels of freezing resistance in sculpin indicated that it is a seasonal phenomonen. The time course of the appearance and disappearance of freezing resistance indicate that this system will be a good model for studying the effect of naphthalene on antifreeze synthesis. (Sinha-OEIS)
W77-01864

PHYSIOLOGICAL IMPACT OF OIL ON PINNIPEDS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
R. Gentry, and W. B. McAlister.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 15-23, April 1976. 1 tab, 3 ref.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Ecology, *Oil spills, Physiological ecology, Otters, Mammals, Continental Shelf, Alaska.
Identifiers: *Outer Continental Shelf, Pinnipeds, Sea otters, Oil exploration, Oil development, Petroleum resources.

Laboratory physiological measurements (metabolic rates and heat flux) are applied to the field problem of pinnipeds and otters encountering an oil spill. Direct measurements of diving behavior in unrestrained animals at sea are also made. The rationale for these two approaches is that for fur bearers oil fouling is likely to directly effect the insulative properties of the fur which will result in altered metabolic costs and impaired diving performance. In non-fur bearers different effects are anticipated. (Sinha-OEIS)
W77-01865

ACUTE AND CHRONIC TOXICITY, UPTAKE AND DEPURATION, AND SUBLETHAL METABOLIC RESPONSE OF ALASKAN MARINE ORGANISMS TO PETROLEUM HYDROCARBONS,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.; and National Marine Fisheries Service, Seattle, Washington. Northwest Fisheries Center.
S. D. Rice, and J. F. Karinen.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 25-47, April 1976. 3 tab.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Ecology, *Oil spills, *Metabolism, *Toxicity, Continental Shelf, Alaska, Bioassays, Aquatic animals.

Identifiers: *Outer Continental Shelf, *Petroleum hydrocarbons, Crude oils, Oil exploration, Oil development, Petroleum resources.

This study was designed to determine the acute and chronic toxicity of crude oil and its component fractions on physiological and behavioral mechanisms of selected arctic and subarctic organisms and to determine recovery rates of selected organisms in laboratory and field studies. Temperature has little effect on toxicity, so that data generated at 12 deg. C can be extrapolated to colder climates. Oil exposures stimulate metabolism in fish, rather than depress metabolism, as in crabs. (Sinha-OEIS)
W77-01866

RESPONSE OF THE CLAM, MACOMA BALTHICA (LINNAEUS), ESPOSED TO PRUDHOE BAY CRUDE OIL AS UNMIXED OIL, WATER-SOLUBLE FRACTION, AND SEDIMENT-ADSORBED FRACTION IN THE LABORATORY,
National Marine Fisheries Services, Auke Bay, Alaska. Auke Bay Lab.; and National Marine Fisheries Services, Seattle, Washington. Northwest Fisheries Center.
T. L. Taylor, J. F. Karinen, and H. M. Feder.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 48-87, April 1976. 8 fig, 10 ref.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Ecology, *Oil spills, *Clams, *Continental Shelf, Alaska, Coasts, Transportation, Sedimentation.
Identifiers: *Outer Continental Shelf, *Intertidal mudflats, *Crude oils, Naphthalene, Tankers, Macoma balthica, Oil exploration, Oil development, Petroleum resources.

The small clam, Macoma balthica (Linnaeus, 1758), occurs throughout the coastal area of Alaska in the upper 4-8 cm of intertidal mudflats. Because it is both a deposit and suspension feeder, M. balthica is potentially susceptible to oil slicks layered on the mud and to water-soluble or sediment-adsorbed fractions of crude oil. Oil adsorbed on sediment and allowed to settle over buried M. balthica stimulated movement to the surface. The proportion of clams that moved to the surface increased as the depth of oil-contaminated sediment increased. In tests many of the clams recovered from exposure, but in nature they might have fallen to predators or adverse environmental conditions. Data on the response of M. balthica to oil can be used in the evaluation of the organism as an indicator of the effect of oil in the sediment environment. (Sinha-OEIS)
W77-01867

EFFECT OF PETROLEUM HYDROCARBONS ON BREATHING AND COUGHING RATES, AND HYDROCARBON UPTAKE-DEPURATION IN PINK SALMON FRY,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
S. D. Rice, R. E. Thomas, and J. W. Short.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 88-118, April 1976. 6 fig, 1 tab, 19 ref.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Ecology, *Oil spills, *Toxicity, *Salmon, Alaska, Continental Shelf, Aromatic compounds, Survival.
Identifiers: *Outer Continental Shelf, *Petroleum hydrocarbons, *Pink salmon fry, *Crude oils, Oncorhynchus gorbuscha, Oil exploration, Oil development, Petroleum resources.

Pink salmon fry, Oncorhynchus gorbuscha, were exposed to the water-soluble fraction of Cook Inlet and Prudhoe Bay crude oils, and No. 2 fuel oil. During 22 h exposures, breathing and coughing rates initially increased as the dose increased but then decreased after several hours. Breathing and coughing rates increased significantly during exposures to oil concentrations as low as 30% of the 96 h median tolerance limit as determined by ultraviolet spectroscopy. It is speculated that the increased respiration rate reflects an increased energy demand for enzyme synthesis. Chronic exposure requiring elevated energy demands may be detrimental to the survival of a population. (Sinha-OEIS)
W77-01868

SUBLETHAL EFFECTS AS REFLECTED BY MORPHOLOGICAL, CHEMICAL, PHYSIOLOGICAL AND BEHAVIORAL INDICES,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
D. C. Malins, H. O. Hodgins, and D. D. Weber.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 119-138, April 1976. 14 ref.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Ecology, Aquatic animals, Trout, Salmon, Continental Shelf, Alaska.
Identifiers: *Outer Continental Shelf, *Petroleum hydrocarbons, *Trace metals, Crude oils, Cell biology, Protein synthesis, Oncorhynchus kisutch, Parophrys vetulus, Oil development, Oil exploration.

Preliminary experiments in cell biology indicated that the liver of trout (Salmo gairdneri) is a primary site of alteration in biochemical activity when the fish ingest crude oil. The liver showed two major changes: a depletion of energy storage products, glycogen and lipid, and an increase in the endoplasmic reticulum, a component of cells that is instrumental in protein synthesis. When coho salmon, (Oncorhynchus kisutch) and English sole (Paraphrys vetulus) were immersed in a sublethal concentration of water-soluble fraction of crude oil there appeared to be a depletion of mucus from the producing cells at the skin surface. These cellular changes are considered to be symptomatic of deleterious effects of petroleum oil on all three species of fish. In contrast, in related experiments, the feeding of intentionally high levels (one part/1000 oil in food) of crude oil to sexually maturing trout for six months did not result in mortality or grossly detectable damage prior to spawning; nor did it appear to impair the viability of their eggs and sperm. (Sinha-OEIS)
W77-01869

IDENTIFICATION OF MAJOR PROCESSES IN BIOTRANSFORMATIONS OF PETROLEUM HYDROCARBONS AND TRACE METALS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
D. C. Malins, W. L. Reichert, and W. T. Roubal.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 139-153, April 1976. 3 ref.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Ecology, Aquatic animals, *Salmon, *Shrimp, Continental Shelf, Alaska.
Identifiers: *Outer Continental Shelf, *Petroleum hydrocarbons, *Trace metals, Flatfish, Arctic environments, Subarctic environments, Oil exploration, Oil development, Petroleum resources.

The objectives of this research unit were the identification and evaluation of certain physiological and biological effects of petroleum hydrocarbons on salmon, flatfish, and spotted shrimp and their larvae. Also included were studies on the effects of trace metals on salmon and flatfish. The effects of petroleum hydrocarbons were evaluated in terms of uptake and depuration studies in which hydrocarbons were administered by diet as well as by exposure to water-soluble fractions via immersion. In both the hydrocarbon and trace metal studies, chemical and physiological parameters will be correlated with data obtained by microscopic techniques. To date, emphasis of this research unit has been largely on the establishment and standardization of experimental techniques and protocols. (Sinha-OEIS)
W77-01870

ASSESSMENT OF AVAILABLE LITERATURE ON EFFECTS OF OIL POLLUTION ON BIOTA IN ARCTIC AND SUBARCTIC WATERS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
D. C. Malins, and M. E. Stansby.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 155-320, April 1976.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Bibliographies, *Biota, Continental Shelf, Alaska.
Identifiers: *Outer Continental Shelf, Oil development, Oil exploration, Petroleum resources, Petroleum hydrocarbons.

Literature is being reviewed backwards from the present time to as far back as anything can be found. While a few references are found dating back as much as 50 years, a preponderance of the material has been published during the last 10 years, much of it during the past three or four years. This information is being developed both in the form of extensive bibliographic reference lists, tabulated under 20 subject headings, and by preparation of a series of critical reviews prepared by scientific specialists from the information gleaned from available reports compiled in the bibliography. Included in this report is a listing of references in rough draft form of over 150 pages. (Sinha-OEIS)
W77-01871

ACUTE EFFECTS - PACIFIC HERRING ROE IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
R. L. Smith, J. G. Pearson, and J. A. Cameron.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 325-343, April 1976. 34 ref. 03-5-022-56.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Herrings, Alaska, Continental Shelf, Intertidal areas, Fisheries, Mortality, Fish larvae, Seepage.
Identifiers: *Outer Continental Shelf, Pacific herring roe, Gulf of Alaska, Crude oils, Clupea pallasii, Oil development, Oil exploration, Petroleum resources.

The objective of this study is to delineate the toxicity of soluble components of crude oil under simulated natural conditions. Toxicity is measured in terms of hatching success and gross morphological abnormalities. Herring spawn in a habitat which is particularly susceptible to the influence of crude oil. Many of the roe are deposited in the intertidal, the larger usually being deposited highest on the beach. Since the larger eggs normally produce the larvae with the greatest chance

of reaching adulthood, the presence of oil on the water and on the beach will select agains the highest quality of eggs in particular and will cause an increased mortality in general. Spills or seepage during the three to four week reproductive period could have significant impact on egg and larval mortality. These mortality rates are already high in nature. Development activities could have a major impact on the herring fishery in Alaska. (Sinha-OEIS)
W77-01872

ACUTE AND CHRONIC TOXICITY OF SEA-WATER EXTRACTS OF ALASKAN CRUDE OIL TO ZOEAE OF THE DUNGENESS CRAB, CANCER MAGISTER DANA,
Oregon State Univ., Newport. Marine Science Center.
R. S. Caldwell.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 345-375, April 1976. 14 fig, 1 tab, 16 ref. 03-5-022-68.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Toxicity, Alaska, Continental Shelf, Crabs, Aromatic compounds.
Identifiers: *Outer Continental Shelf, Dungeness crabs, Cancer magister, Zoeae, Benzene, Naphthalene, *Crude oils, Oil exploration, Oil development, Petroleum resources.

The full strength seawater soluble fraction of Cook Inlet crude oil is acutely toxic to first instar C. magister larvae but no lethalor sublethal effects were found of an approximately 1/10 dilution of this fraction during a 28-day continuous exposure period. In similar long-term exposures, 0.16 ppm naphthalene, the highest concentration tested, is also without effect on the larvae but 7.2 ppm benzene and possibly also 1.4 ppm benzene result in reduced larval survival. The effects of benzene appear to be manifested at the time of the first zoeal molt in these longterm exposures. A comparison of the lethal concentration of benzene with the estimated concentration of this aromatic compound in the full strength seawater soluble fraction of crude oil suggests that benzene may account for a major portion of the toxicity of this fraction. Since the concentrations of many of the seawater extractable components of crude oil may be expected to decline rapidly under natural environmental conditions as a result of dilution, evaporation, and metabolism by microorganisms, these studies suggest that crude oil contaminations of seawater may not seriously affect decapod larvae as long as the larvae do not contact the oil/water interface. (Sinha-OEIS)
W77-01873

SUBLETHAL EFFECTS - EFFECTS ON SEA GRASS,
Alaska Univ., College. Inst. of Marine Science.
J. D. Pearson.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 8. Effects of Contaminants, p 377-389, April 1976. 1 fig. 03-5-022-56.

Descriptors: *Environmental effects, *Resources development, *Water pollution effects, *Baseline studies, *Cold regions, *Oil pollution, *Toxicity, *Primary productivity, *Aquatic plants, *Food chains, Continental Shelf, Alaska, Grasses, Ice cover, Photosynthesis.
Identifiers: *Outer Continental Shelf, *Sea grass, *Petroleum hydrocarbons, Zostera marina, Oil exploration, Oil development, Petroleum resources.

This study is directed at evaluating the effects of selected petroleum hydrocarbons (dodecane, toluene, and napthalene) on rates of photosynthesis in Zostera marina. Since Z. marina is a major contributor to primary production in many ecological niches along the Alaskan coastline, it is imperative to understand what possible effects of plant exposure to low-levels of the more water soluble and toxic components of petroleum. Deleterious effects on sea-grass could disrupt whole food chains. (Sinha-OEIS)
W77-01874

EVALUATION STRATEGIES OF METAL POLLUTION IN OCEANS,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5A.
W77-01875

CHANGES IN BIOCENOSES OF PLANKTONIC ORGANISMS UNDER CONDITIONS OF A SEMI-CLOSED PRODUCTION COOLING SYSTEM AND A WATER PURIFICATION SYSTEM, (IN RUSSIAN),
Akademiya Nauk Litovskoi, SSR, Vilnius. Inst. of Botany.
K. K. Yankyavichyus, A. Y. Baranauskene, V. Y. Gribauskene, D. P. Kitrene, and B. A. Malamene.
Liet Tsr Mokslu Akad Darb Ser C Biol Mokslai 1, p 13-20, 1975.

Descriptors: *Water purification, Plankton, *Zooplankton, *Cooling water, *Algae, Microorganisms, *Bacteria, Organic matter, Ions.
Identifiers: *Biocenoses, Deionized water.

Investigation in 1971-1972 of semi-closed production cooling system water (N production) and water of a high purification degree system (electronic industry) showed the river water to be polluted with organic substances in the semi-closed system. Removal of the organic substances caused development of algae and heterotrophic planktonic organisms (zoo-and bacterioplankton). In the high purification degree system the microorganisms increased in ionic (anions and cations) resins; the highest numbers of microorganisms (168,000 - 3 million cells/ml) and their metabolities (hydrolytic ferments) were detected in deionized water.--Copyright 1976, Biological Abstracts, Inc.
W77-01876

DISEASE RISKS OF OCCUPATIONAL EXPOSURE TO SEWAGE,
Cincinnati Univ., Ohio. Environmental Health Engineering.
C. S. Clark, E. J. Cleary, G. M. Schiff, C. C. Linnemann, Jr., and J. P. Phair.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE2, p 375-388, Proceedings paper No. 12038, April 1976. 3 tab, 61 ref.

Descriptors: *Sewage bacteria, *Environmental engineering, *Diseases, *Epidemiology, Shigella, Waste water(Pollution), Treatment facilities, Risks, Water pollution effects, Public health, Parasites.
Identifiers: *Gastrointestinal diseases, *Health hazards, *Viral diseases, *Serology, *Infectious hepatitis, Antibodies, Leptospira, Parasitic diseases, Sewage works, Tuberculosis, Typhoid.

A need exists for assessment of the potential health risks to the public from waters receiving waste discharges. Some insight concerning such risks may be gained from a review of studies of persons exposed on an occupational basis to waste water, i.e., those working at waste water treatment plants and in sewers. The most complete investigation in the literature was a retrospective study of Berlin sewer workers reported in 1954. This investigation revealed less evidence of occupational disease hazards than did some more limited studies which showed increased antibody levels to leptospirosis, frequent gastrointestinal illness, and increased parasitic infections, such as Endamoeba histolytica, Ascaris lumbricoides, and Trichurus trichiura. Studies on airborne transmission from waste water have thus far focused on bacterial levels near waste treatment facilities and not on health effects. (Bell-Cornell)
W77-01877

EFFECTS OF URANIUM MINING AND MILLING ON GROUND WATER IN THE GRANTS MINERAL BELT, NEW MEXICO,
Office of Radiation Programs, Las Vegas, Nev.
R. F. Kaufmann, G. G. Eadie, and C. R. Russell.
Ground Water, Vol. 14, No. 5, p 296-308, September-October 1976. 9 fig, 3 tab, 23 ref.

Descriptors: *New Mexico, *Uranium radioisotopes, *Mining, *Groundwater, Background radiation, Radium radioisotopes, Ion exchange, Nitrates, Environmental effects, Water pollution, Potable water, Municipal water.
Identifiers: *Uranium mining and milling, *Grants mineral belt, Ion exchange plant effluents, Radium, Selenium, Ore body, Environmental monitoring programs.

Groundwater contamination from uranium mining and milling resulted from the infiltration of mine, mill, and ion-exchange plant effluents containing elevated concentrations of radium, selenium, and nitrate. The discharge of such highly contaminated mine effluents into streams and seepage from tailings ponds created a long-lived source of groundwater contamination. The shallow aquifer in use and downgradient from another mill have been grossly contaminated with selenium, attributable to excessive seepage from a nearby tailings pond. Radium, selenium, nitrate, and, to a lesser extent, uranium were of most value as indicators of groundwater contamination. Gross alpha results were not consistent indicators of radium or uranium in water, although uranium did appear to be the principal contributor of alpha activity. Accurate radium-226 analyses yielded the most information for radiological evaluation of drinking water. At that time, no adverse impacts on municipal groundwater supplies had been observed. However, industry-sponsored environmental monitoring programs were inadequately designed and implemented and did not define the full, long-term impact of mining and milling operations on the groundwater quality of the study area. (Roberts-ISWS)
W77-01923

POSSIBILITIES FOR THE SYSTEMATIC ORGANIZATION OF AQUATIC BIRD HABITATS, (IN GERMAN),
L. Kalbe.
Beitr Vogelkd. 20(5), p 390-393, 1974.

Descriptors: *Lakes, *Oligotrophy, *Reproduction, *Birds, *Waterfowl, Vegetation establishment, Drainage practices, Drainage programs, Dredging, *Habitat improvement.
Identifiers: *Bird breeding, *Artificial islands, *Reed mowing, Rafts.

Four cases of successful oligotrophication of lakes are reviewed. The introduction of anchored rafts serving as artificial islands, reed mowing, annual or biennial drainage, the construction of new islands from dredging residue and the planting of new vegetation are proposed as measures for improving bird breeding conditions.--Copyright 1974, Biological Abstracts, Inc.
W77-01950

NITROGEN AND PHOSPHORUS UPTAKE IN THE EVERGLADES CONSERVATION AREAS, FLORIDA, WITH SPECIAL REFERENCE TO THE EFFECTS OF BACKPUMPING RUNOFF,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W77-02012

AN EVALUATION OF METHODS FOR MEASURING ALGAL GROWTH,
Geological Survey, Doraville, Ga.
For primary bibliographic entry see Field 5A.
W77-02018

EVALUATION OF THREE COLLECTING METHODS FOR A RECONNAISSANCE OF STREAM BENTHIC INVERTEBRATES,
Geological Survey, Menlo Park, Calif., and Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 5A.
W77-02028

KINETICS OF SILICON-LIMITED GROWTH IN THE FRESHWATER DIATOM ASTERIONELLA FORMOSA,
Michigan Univ., Ann Arbor. Div. of Biology.
S. S. Kilham.
Journal of Phycology, Vol. 11, No. 4, p. 396-399, 1975. 2 fig., 2 tab., 20 ref. NSF GB-41315.

Descriptors: *Silica, *Diatoms, *Growth rates, Freshwater, Laboratory tests, *Kinetics, Succession, Europe, Lakes.
Identifiers: *Asterionella formosa, Lake Ohrid(Jugoslavia), Lake Windermere(England).

Growth rates of two clones of the freshwater planktonic diatom Asterionella formosa were measured under conditions in which external silicon concentrations controlled growth in order to examine the kinetics of the growth response to limiting concentrations of silicon and to determine if intraspecific differences in response occur. Clone AfOH2 from Lake Ohrid, Jugoslavia, had a higher maximum growth rate (1.11 doublings/day) and apparent half-saturation constant (1.93 micromoles silicon) than clone L262 from Lake Windermere, England (0.61 doublings/day and 1.09 micromoles silicon). The silicon concentration where the growth rate equals 0.9 micron the maximum growth rate (above this concentration the nutrient is presumed to be non-limiting to growth) was 13.8 micromoles silicon for clone AfOH2 and 6.5 micromoles silicon for clone L262. These studies agreed with field observations showing A. formosa populations decreasing below 0.5 mg/l silicon dioxide (8.4 micromoles silicon). Calculations of yield showed a range of 0.5-1.5 micromoles silicon/million cells for clone AfOH2 and 0.6-1.9 micromoles silicon/million cells for clone L262. If similar relationships between physiological data and field observations can be shown for other species and clones of diatoms, more realistic models for seasonal successions of phytoplankton can be developed. (Buchanan-Davidson--Wisconsin)
W77-02035

STATEMENT OF CONCERNS OF THE LAKE MICHIGAN TOXIC SUBSTANCES COMMITTEE RELATED TO POLYCHLORINATED BIPHENYLS,
Environmental Protection Agency, Chicago, Ill.
K. E. Bremer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 786, Price codes: A03 in paper copy, A01 in microfiche. Report July 1975. 29 p. 3 tab., 21 ref.

Descriptors: *Lake Michigan, *Polychlorinated biphenyls, *Hazards, *Regulation, Effects, Conferences, Fisheries, *Pesticide residues, Industries, Public health, Aroclor, Electric insulation, *Toxicity, Salmonids, Water pollution sources, Wisconsin, Michigan, Indiana, Illinois, Sewage effluents, Capacitors, Power transformers, Standards, Food chains.
Identifiers: PCB industrial uses, *PCB toxicity.

In view of the documented evidence on 19 biological and toxicological effects of PCBs, the committee, representing three federal agencies and the four states bordering Lake Michigan, proposed that all domestic and imported PCBs (marketed as various formulations of Aroclor) destined for industrial uses other than as a dielectric fluid in transformers and capacitors be banned; and the latter usages to be contingent upon development of replacement products. PCB concentrations in Lake Michigan fish are probably not decreasing and particularly the larger salmonids exceed the FDA 5 ppm maximum alowable levels. It is probable that this level will be further reduced in view of recent primate toxicological evidence. The only American manufacturer, Monsanto Company, has been unable to restrict distribution and agency efforts have not reduced PCBs in the lake. It is probable that treated sewage effluents are ubiquitous PCB sources at or below detectable levels. An economic loss has been inflicted on the commercial fishery and a much larger loss to the commercial and sport fishing industries would result if the FDA lowers the permissible levels. PCBs in many industrial processes and products continue to be widespread regardless of Monsanto's policy to restrict sales only to closed systems. Most PCB uses can be eliminated or replaced by substitute chemicals. (Auen-Wisconsin)
W77-02038

PICHIA SPARTINAE, A DOMINANT YEAST OF THE SPARTINA SALT MARSH,
Louisiana State Univ., Baton Rouge.
S. P. Myers, D. G. Ahearn, S. K. Alexander, and W. L. Cook.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 306, Price codes: A02 in paper copy, A01 in microfiche. Development in Industrial Microbiology, Vol. 16, p. 261-267, 1975 (Report No. LSU SG-75-R1, 8 p.) 3 fig., 2 tab., 9 ref. NOAA 04-3-158-19.

Descriptors: *Yeasts, *Salt marshes, *Plant physiology, *Energy conversion, Aquatic plants, Grasses, Reproduction, Symbiosis, *Louisiana, Microbiology, Microbial degradation.
Identifiers: *Pichia spartinae, *Spartina alterniflora, Sea grasses, *Barataria Bay(La), Oyster grass.

Production of Spartina alterniflora in Louisiana's coastal marshes is estimated at 2960 g dry wt/sq m/yr and the detrital formation from this plant biomass is the basis of the nutritional cycle of the entire estuarine system. This organic detritus is rich in carbohydrates and lipids which serve as nutrients for the yeast population of Pichia Spartinae, which is able to utilize the angiosperms as an energy source as well as a total nutrient source. Six major fractions of Spartina lipids were utilized by P. spartinae as sole carbon sources, while another marsh yeast, Kluyveromyces drosophilarum, utilized only the most polar lipid fractions. P. spartinae occurs in concentrations up to 90 million cells/g in intraculm cell liquid and viable tissues of Spartina. Highest densities occur at the outer Spartina surfaces during summer and early fall. In addition to lipids, P. spartinae assimilates plant hydrolysates, various amines, and both alpha and beta glucosides. Ascosporulation was observed most readily in fresh culm isolates and is frequently sparse in stock cultures. The beta-glucosidase activity of this yeast may have particular significance in detrital formation and associated protein formation. Emphasis is placed on the isolation of vigorously ascosporulating strains of P. spartinae from the intraculm of Spartina. (Auen-Wisconsin)
W77-02039

APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF LAKE EUTROPHICATION IN THE GREAT LAKES BASIN,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
R. H. Rogers, and J. P. Scherz.
Report NASA CR-143409, Goddard Space Flight Center, Greenbelt, Md. August 1975. 44 p, 23 fig. NAS 5-20942.

Descriptors: *Data processing, *Satellites(Artificial), *Eutrophication, *Surveys, *Lake Huron, Land use, Trophic level, Wisconsin, Michigan, Suspended solids, Algae, Turbidity, Light penetration, Great Lakes Region.
Identifiers: *LANDSAT, *Saginaw Bay(Lake Huron), ERTS.

The progress achieved during the three-month period ending August 11th of support surveillance is reported. The satellite provided data for correlation with the Environmental Protection Agency's water quality survey and modeling of eutrophication of Saginaw Bay in Lake Huron and for Michigan's Department of Natural Resources survey of lakes to determine their pollution potential as related to land uses and various land covers. These categories can be classified and mapped successfully using the LANDSAT data. Wisconsin's Department of Natural Resources is also attempting to develop a lake trophic level classification method and is evaluating the utility of LANDSAT data. Results show that lakes can be classified by LANDSAT data processing into types characterized by varying amounts of suspended particles (algae and silt), colored solutes (tannins), weeds, and bottom reflectance. A technique developed eliminates surface noise effects on LANDSAT signals from water bodies; the residual signal dependent only on the material in the water was used as a basis for computer categorization by type and concentration of suspended matter. Late summer was the preferred time to monitor trophic levels; primary production levels generally stabilize during late August to early September. Bottom effects on lake reflectance were best identified in late spring when the water was clearest. (See also W77-02042) (Auen-Wisconsin)
W77-02041

APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF LAKE EUTROPHICATION IN THE GREAT LAKES BASIN,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
R. H. Rogers.
Report NASA CR-145699, Goddard Space Flight Center, Greenbelt, Md. November 1975. 50 p. 13 fig., 4 tab., 21 ref., 4 append. NAS 5-20942.

Descriptors: *Satellites(Artificial), *Surveys, *Eutrophication, Data processing, Michigan, Ohio, North Carolina, Kentucky, Indiana, Turbidity, Suspended solids, Light penetration, Conductivity, *Lake Huron, Watersheds(Basins), Chlorides, Chlorophyll, Phosphorus, Nitrogen, Potassium, Calcium, Sodium, Magnesium, Forests, Agriculture, Mapping, Water temperature, Great Lakes Region.
Identifiers: *LANDSAT, ERTS, Saginaw Bay(Lake Huron).

A progress report for the three-month period ending November 11, 1975 details LANDSAT's effectiveness in concert with ground truth data. Computer techniques for mapping 12 chemical and biological parameters in Saginaw Bay (Lake Huron) demonstrated that the application of stepwise linear regression to ground truth measurements and corresponding LANDSAT measurements produced relationships that can be applied to map any one of these parameters for the entire bay. LANDSAT computer compatible tapes (CCTs) were used for inventorying land uses in 225 drainage areas in the nine counties of the Ohio-Kentucky-Indiana region. Computer tabulations produced 16 land-use categories, which were merged into ten categories, and mapped at a 1:5000 scale, with detail to 0.44 hectare. These products were produced in less than 90 days at one cent per acre. CCTs were also used as a basis for inventorying land cover within North Carolina's Raleigh-Durham-Chapel Hill area. Ten land cover categories were interpreted at a detail of 0.44 hectare and included three urban densities, four forest types, agricultural lands, bare soil-construction sites, and

water. This taped data is being aggregated into 4-hectare grid cells and merged with soils and slope data to compute sediment and nutrient flows. This complete inventory was accomplished within 60 days at a cost of about one-half cent per acre. (See also W77-02041) (Auen-Wisconsin)
W77-02042

FOOD SELECTION AND FEEDING RELATIONSHIPS OF YELLOW PERCH (PERCA FLAVESCENS MITCHELL), WHITE BASS (MONONE CHRYSOPS (RAFINESQUE)), FRESHWATER DRUM (APLODINOTUS GRUNNIENS (RAFINESQUE)), AND GOLDFISH (CARASSIUS AURATUS (LINNEAUS)), IN WESTERN LAKE ERIE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
D. E. Kenaga, and R. A. Cole.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 208, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 32.5, October 1975. 57 p. 11 fig., 15 tab., 51 ref., append. X-290059.

Descriptors: *Fish diets, *Lake Erie, *Powerplants, *Fish food organisms, *Selectivity, *Drums, *Yellow perch, *White bass, Heated water, Size, Cooling water, Varieties, *Michigan, Thermal pollution.
Identifiers: Goldfish, Monroe(Mich), *Raisin River(Mich).

This investigation was oriented toward the impact of a once-through cooling system of a large power plant in western Lake Erie at the mouth of the Raisin River near Monroe, Michigan, on the feeding habits and efficiency of four fish species. Large prey organisms (Leptodora kindtii and Chironomus) were selected by drum, white bass and yellow perch; those older than age 1 eat similarly sized organisms and thus may compete interspecifically, but young-of-the-year food consumption is more diverse. Goldfish eat differently sized foods from the other fishes at all ages thus are not competitors. Any further depression in food sizes, such as might result from increased numbers of power plants or the loss of any one relatively important prey specie, or a size-related shift in prey abundance, could cause a shift in feeding intensity of the remaining organisms and in turn affect the relative growth and fish species composition. Zooplankton density did not appear to limit growth, but their small size, in relation to predator size, may have decreased fish feeding efficiency and growth rates. Power plant entrainment may cause more damage to large plankton than to smaller zooplankton because they may be more susceptible to mechanical damage in once-through cooling systems. (Auen-Wisconsin)
W77-02043

METHOD OF EVALUATING THE CONTENT OF NATURAL RADIOACTIVE ISOTOPES OF THE URANIUM AND THORIUM SERIES IN DRINKING WATER AND FOOD, (IN RUSSIAN),
E. L. Mordberg, and I. L. Shalaev.
Gig Sanit 6, p 52-55, 1975.

Descriptors: *Radioisotopes, *Uranium, *Potable water, Radioactivity, Lethal limit, Water pollution effects, Toxicity.
Identifiers: *Thorium.

Formulas are presented for evaluating the (human) radiation hazard of the uptake of radioactive isotopes of the U and Th series (U238,235, 234, Pa231, Th234, 232, 230, 228, 227, Ac227, Ra228, 226, 224, 223, Po210, Pb210) from water having high concentrations or from agricultural products grown on soil with a high natural background or contaminated by these isotopes as a result of industrial activity. The limits are given for the annual uptake of isotopic soluble forms via the digestive system for various organs (bone, gastrointestinal tract, liver, spleen, and kidneys).--Copyright 1976, Biological Abstracts, Inc.
W77-02070

5D. Waste Treatment Processes

FINAL REPORT, MSF MODULE STUDIES, OSW SAN DIEGO TEST FACILITY.
Burns and Roe Construction Corp., Paramus, N. J.
For primary bibliographic entry see Field 3A.
W77-01551

HYGIENIC ASSESSMENT OF MEMBRANE METHODS OF WATER DESALINIZATION, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
Y. A. Rakhmanin, G. I. Rozhnov, and S. G. Davydova.
Gig Sanit 7, p 22-25, 1975.

Descriptors: *E. Coli, *Desalination, *Waste water treatment, Membrane processes, *Viruses, *Bacteriophages, Cellulose membranes, Public health, Bacteria.
Identifiers: *Adenoviruses.

The quality of water desalinized by various membrane methods depends on the type and construction of the installations used, the level of mineralization and the composition and properties of the treated water. Preliminary testing of water desalinized by the membrane methods for possible hygienic problems is recommended. The highly selective acetylcellulose membrane was not permeable to Escherichia coli and viruses (bacteriophages and adenoviruses).
W77-01554

HYGIENIC EVALUATION OF THE STATE OF PROTECTION OF A WATER BODY FROM POLLUTION IN THE REGION OF AN INDUSTRIAL COMPLEX, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
N. V. Klimkina, R. S. Ekhina, M. P. Gracheva, and Yu. P. Tikhomirova.
Gig Sanit 7, p 34-38, 1975.

Descriptors: *Waste water treatment, Waste water disposal, *Industrial wastes, Treatment facilities, *Toxicity, Water pollution sources, Rodents.
Identifiers: *USSR.

Although there was a constant increase in production and in the total volume of wastewater discharge in 1968-1973, the quantity of pollutants discharged with the wastewaters decreased slightly. In 1972-1973 the total pollutants in the wastewaters decreased by almost 2-fold in comparison with 1968. This was due to the construction of about 80 treatment plants at the industrial enterprises, organization of the consumption and disposal of water and reduction of pollutants in the wastewaters. The toxicological characteristics of industrial wastewaters before and after treatment (obtained in chronic experiments on mice) are presented.
W77-01555

HYGIENIC CHARACTERISTICS OF WASTEWATER TREATMENT PROCESSES OF FLAX-PROCESSING PLANTS, (IN RUSSIAN),
V. F. Golubev.
Gig Sanit 7, p 109-110, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, Biochemical oxygen demand, *Organic acids, *Pulp wastes, Textiles, Chemical oxygen demand.
Identifiers: Caproic acid, Valeric acid, Butyric acid, Propionic acid, Acetic acid, Formic acid.

The wastewaters of flax-processing plants have high 5-day biochemical O2 demand and chemical O2 demand and contain various organic acids (caproic, valeric, butyric, propionic, acetic, formic) and water-soluble gases. The water treatment plants can not provide purification of the wastewaters.
W77-01556

LAND DISPOSAL OF LIQUID SEWAGE SLUDGE: III. THE EFFECT ON SOIL NITRATE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
L. D. King, and H. D. Morris.
J Environ Qual. 1(4), p 442-446, 1972.

Descriptors: *Sludge disposal, Sewage disposal, *Soil contamination effects, *Liquid wastes, *Soil chemical properties, *Clay loam, Denitrification, Treatment, *Sludge treatment, *Sewage treatment, *Nitrates, Waste water disposal.
Identifiers: Cynodon-dactylon, *Cecil clay loam, Chemical fertilizer treatment.

A field experiment was conducted over a 2-yr period to determine the effect of liquid sewage sludge on soil nitrate content of a Cecil study clay loam (Typic Hapludults) to a 120-cm depth. Periodic applications of 4 rates of sludge to coastal bermudagrass (Cynodon dactylon L. Pers.) supplied a total of 4.4, 8.8, 10.0 and 20.0 cm of sludge in 1969 and 2.5, 5.0, 10.0 and 20.0 cm in 1970. Respective amounts of N applied by the 4 rates were 1037, 2074, 2580, and 5160 kg/ha in 1969 and 492, 984, 1970 and 3940 kg/ha in 1970. A chemical fertilizer treatment supplied 364 kg/ha of N in 1969 and 489 kg/ha in 1970. The 2 highest sludge rates affected significant increases in soil nitrate in the 0-120-cm profile. The other 2 sludge rates and the chemical fertilizer treatment did not increase soil nitrate and were deemed safe from the standpoint of potential groundwater pollution. At the 20-cm rate 40% (287 kg/ha) of the NO3-N present in the 0- to 120-cm profile in Oct. 1970 could not be accounted for the following May. Of the N supplied by the 10- and 20-cm applications, 17 and 9%, respectively, was recovered through crop uptake while 56 and 54% remained in the sludge crust that had accumulated on the soil surface.--Copyright 1973, Biological Abstracts, Inc.
W77-01557

EFFECTIVENESS OF METHODS OF IMPROVING DRINKING WATER QUALITY (FLUORIDATION, DESALINATION, MAGNETIC TREATMENT, ETC., (IN RUSSIAN),
Meditsinskii Institut, Saratov (USSR).
For primary bibliographic entry see Field 5F.
W77-01558

FORMATION OF WATER QUALITY BY AQUATIC ORGANISMS, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5G.
W77-01561

OPERATING EFFICIENCY OF FACTORY SEWAGE TREATMENT PLANTS, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi Gidrogeologii, Moscow (USSR).
L. A. Sergunina, E. S. Razumovskii, S. N. Bedimogov, A. M. Solygub, and K. P. Ershova.
Gig Sanit 5, p 93-96, 1975.

Descriptors: *Sewage treatment, *Waste water treatment, Treatment facilities, *Oxidation, *Aeration, *Activated sludge, Biochemical oxygen demand, Operations, *Performance.

Wastewater treatment plants with a capacity of 12-700 m3/day were developed. Plants with a capacity

of up to 200 m3/day use complete oxidation; aeration tanks with low organic pollutant loads (up to 100 mg 5-day biochemical O2 demand/g activated sludge per day) are used. Plants with capacity of 200-700m3/day use aeration with aerobic stabilization of activated sludge; aeration tanks with loads common for municipal treatment plants but without primary settling are used, and excess activated sludge is removed to and treated in aerobic stabilizers.--Copyright 1976, Biological Abstracts, Inc.
W77-01577

ORGANIZATION OF WORK ON THE SANITARY PROTECTION OF WATER BODIES IN THE RYAZAN OBLAST, (IN RUSSIAN),
Razanskii Meditsinskii Institut (USSR).
G. A. Strelyukina, E. V. Zaichik, M. P. Selin, and K. N. Chelikanov.
Gig Sanit 5, p 98-99, 1975.

Descriptors: *Water reuse, *Recycling, *Waste water treatment, Chemical wastes, Sewage treatment, Water pollution control.
Identifiers: Russian-SFSR, *Ryazan Oblast(USSR).

To prevent water pollution in the Ryazan Oblast (Russian SFSR, USSR), waste-water quantity is reduced by using water recirculating systems and by recovering chemical substances. More than 1 million m3 of water is recycled daily and about 200,000 tons of valuable ingredients are recovered from wastewaters annually. New treatment plants are being built. The goal is to eliminate completely the discharge of raw sewage into surface waters by 1980.--Copyright 1976, Biological Abstracts, Inc.
W77-01578

CONSIDERATIONS ON THE WASTE WATER QUALITY AND TREATMENT AT THE ANTIBIOTICS PLANT FROM JASSY, (IN HUNGARIAN),
A. Cicei, and E. Juriari.
Stud Epurarea Apelor 16(1-7), p 181-221, 1974.

Descriptors: *Water pollution sources, *Activated sludge, *Waste water treatment, Industrial wastes, Water pollution control.
Identifiers: *Antibiotics, *Romania.

The sources of antibiotics plant water pollution (Jassy, Romania) were analyzed and the reduction of their quantity and loading before entering the treatment plant were studied. The most efficient treatment methods use activated sludge.--Copyright 1976, Biological Abstracts, Inc.
W77-01580

RESEARCHES ON THE BIODEGRADABILITY AND TOXICITY OF SOME POLLUTANTS EXISTING IN WASTE WATERS DISCHARGED BY THE PETROCHEMICAL INDUSTRY, (IN HUNGARIAN),
For primary bibliographic entry see Field 5C.
W77-01581

LABORATORY RESEARCH METHODOLOGY OF WASTE WATER TREATABILITY BY ACTIVATED SLUDGE PROCESS, (IN HUNGARIAN),
L. Vaicum.
Stud Epurarea Apelor 16(1-7), p 7-49, 1974.

Descriptors: Methodology, *Activated sludge, *Organic matter, *Biological treatment, *Waste water treatment, Industrial wastes, *Sludge treatment, Microorganisms.
Identifiers: Respirometers, Warburg apparatus.

Biological treatment of waste waters containing predominantly organic matter is the most economical. Organic compounds are sometimes toxic for the microorganisms in the treatment facilities. To check the feasibility of biological treatment of organic industrial waste water, a laboratory research method for activated sludge treatment was devised. This method is based on respirometric experiments with the Warburg apparatus and on laboratory models of activated sludge treatment.--Copyright 1976, Biological Abstracts, Inc.
W77-01582

THE BIODEGRADABILITY OF SOME ORGANIC POLLUTANTS PRESENT IN THE WASTE WATERS RESULTED FROM THE PETROLEUM REFINERIES, (IN HUNGARIAN),
L. Vaicum, and L. Stefanescu.
Stud Epurarea Apelor 16(1-7), p 50-75, 1974.

Descriptors: *Biodegradation, Organic wastes, *Biological treatment, Microorganisms, Toxicity, *Activated sludge, Toxicity, *Waste water treatment, Industrial wastes, Organic compounds.
Identifiers: Mercaptans, Naphthenates, Respirometers, Sulfonates, Warburg apparatus.

Biological treatment of petroleum refinery waste water is affected by pollutants (e.g.,sulfonates,mercaptans,naphthenates) that are toxic for the microorganisms in the treatment plants. Pollutant biodegradability was studied by testing the respiration of activated sludge microorganisms in the presence of these substances in the Warburg respirometer and by observing the treatment efficiency in the laboratory. Naphthenic lyes did not inhibit the respiration of the microorganisms in the activated sludge, if the concentration of these lyes in the waste water does not surpass 500 mg/l. Sulfonic lyes were toxic only in concentrations above 50 mg/l. The toxic effects of sulfonic lyes are partially due to their emulsifying efficiency on petroleum products and to their foaming power. Allyl-mercaptan(pure) was very toxic for microorganisms even in small concentrations (5 mg/l).
W77-01583

SOME RESULTS OF THE FULL-SCALE TESTS OF THE LABORATORY RESEARCHES ON THE BIOLOGICAL TREATMENT OF WASTE WATERS FROM HOG BREEDING FARMS, (IN HUNGARIAN),
C. A. L. Negulescu, and E. Cute.
Stud Epurarea Apelor 16(1-7), p 222-234, 1974.

Descriptors: *Activated sludge, *Waste water treatment, Hogs, Farm wastes, *Biological treatment.

The activated-sludge process is easily applied to hog breeding farm waste water treatments.
W77-01584

RESEARCHES ON THE BIOLOGICAL TREATABILITY OF WASTE WATERS RESULTED FROM THE ORGANIC COLOUR SYNTHESIS, (IN HUNGARIAN),
L. Vaicum, T. Ognean, and L. Stefanescu.
Stud Epurarea Apelor 16(1-7), p 99-127, 1974.

Descriptors: Activated sludge, Biological treatment, Waste water treatment, Dyes, Dying, Industrial wastes, Color.
Identifiers: Respirometers, Warburg apparatus.

Complex physico-chemical and biological processes for treatment of dye industry wastes are discussed. The biological treatability of tritane dyes, the chromatable-, azo-and sulfur acids, and Faron, Resolin and Esterofil dyes was assessed. The Warburg respirometric procedure was used; the respiration of the activated-sludge suspension in the presence of waste waters treated, neutralized and diluted so that the concentration of organic matter would not cause inhibition was studied.
W77-01585

MODELLING OF PROCESSES AND PLANTS FOR WASTE WATER SETTLING, (IN HUNGARIAN),
A. Munteanu.
Stud Epurarea Apelor 16(1-7), p 128-180, 1974.

Descriptors: Model studies, *Pulp wastes, Pulp and paper industry, Settling velocity, *Settling basins, *Treatment facilities, *Waste water treatment, Operation, Performance.

Waste waters from a pulp and paper mill were studied. Settling experiments were made with static suspensions. A correlation between water layer, height retention time and settling efficiency was established, and design parameters of settling plants were determined. Settling experiments with hydrodynamic suspensions showed that modeling according to the water velocity identity criterion gives the best results. A small size model for different types of settlers is useful for improving efficiency.
W77-01586

MUNICH'S CONTRIBUTIONS TO SEWAGE, FISHERY AND STREAM BIOLOGY, VOL. 26. WATER FOR LAND RECLAMATION AREAS, (IN GERMAN),
Bayerische Biologische Versuchsanstalt, Munich (West Germany).
R. Oldenbourg Verlag: Muenchen, West Germany 1975, 334 p.

Descriptors: Biology, Water pollution, Sewage, Cooling water, Water temperature, Waste water disposal, Waste water treatment, Aeration, Ozone, Chlorination, Recreation, Viruses, *Land reclamation.

Among the topics covered in this book are streams as ecological systems, water pollution monitoring systems, increased stream temperatures due to cooling water from hydroelectric power plants, the disposal of water from nuclear reactors, chemical and biological testing of lakes used for recreation, the epidemiological and epizootological significance of pathogenic microorganisms in surface water and sewage, the use of O3 and Cl in recreational waters and its bacteriological effects. Also discussed are virological studies at a sewage purification plant which uses O3, the use of abandoned brown coal mines as reservoirs, water Hg content, sewage disposal at campgrounds, the use of recreational waters for fishing and the aeration of lake and flowing waters.
W77-01598

HYGIENIC STUDY OF THE TOXIC PROPERTIES OF METHANOL-CONTAINING RECLAIMED WATER, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-01602

EFFECT OF ABATE (DIPHOS) ON THE GENERAL SANITARY CONDITIONS OF WATER BODIES: II, (IN RUSSIAN),
V. Yu. Akhundov, K. F. Akhundov, and A. P. Mamedova.
Izv Akad Nauk Az Ssr Ser Biol Nauk. 2, p 112-117, Illus. 1974. (Azerb. summ.).

Descriptors: *Pesticides, *Ammonium compounds, *Nitrites, *Environmental sanitation, *Water treatment, Organic compounds, Dissolved oxygen, Biochemical oxygen demand, Nitrification, Bacteria, Hydrogen-ion concentration, Model studies.
Identifiers: Diphos.

The sanitary conditions of experimentally modeled waters treated with the pesticide diphos were studied. Addition of 88 and 92% diphos into the waters increased the quantity of organic substances, including ammonium and nitrites. Diphos also decreased the O2 concentration in the waters.

Small doses of 88% diphos (0.606 mg/l) and 92% diphos (0.055 mg/l) destroyed the normal course of the biochemical O2 demand process of the waters. The 0.055 mg/l dose of 92% diphos did not change the nitrification processes. Only the 0.055 mg/l dose of 92% diphos was not harmful in terms of bacteriological indices. Diphos did not change the pH of the experimental waters.--Copyright 1975, Biological Abstracts, Inc.
W77-01607

THE WASTE TREATMENT FACILITY OF MONADNOCK PAPER MILLS, INC.
American Paper Industry, Vol. 58, No. 9, p 10-13, September, 1976. 5 illus, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, *New Hampshire, Hydrogen ion concentration, Ammonia, Suspended solids, Biochemical oxygen demand, Aerated lagoons, Temperature, Oxygenation, Water purification, Oil, Turbidity, Coagulation, Settling basins, Tertiary treatment, Cations, Polymers, Outlets.
Identifiers: *Contoocook River(New Hampshire), Clarifiers.

The effluent from the nonintegrated paper mill at Bennington, New Hampshire, producing 75 tons/day of technical grade and specialty papers, flows to a surge tank where NaOH is added to control pH and a cationic polymer (Aquafloc) is introduced along with ammonia. It then flows to a 45-ft diameter Dorr-Oliver Clarifloculator where almost all of the settleable solids and about 94% of the total suspended solids, as well as approximately 30% of the BOD, are removed by coagulation and settling. Overflow from the Clarifloculator is treated with phosphoric acid before flowing into two 2,500,000 gallon aeration ponds. After secondary treatment, the effluent flows by gravity to the tertiary system where it is held for 3 days in two 1,500,000 gallon settling ponds. Overflow from the tertiary system passes into a stilling chamber where a sample is collected for pH and temperature analysis, and then through a flume equipped with a flow recorder and integrator. After leaving the flume, the effluent is mixed in line with air to insure complete oxygen saturation before discharging into the Contoocook River via a submerged and diffused outfall pipe. The treated effluent contains 15 ppm of suspended solids, no detectable settleable solids, 15 ppm BOD, and 1 ppm of oil and grease, and has a Jackson turbidity value of 9. (Witt-IPC)
W77-01641

INTRODUCTION OF A NEW EFFLUENT PURIFICATION SYSTEM (VNEDRENIE NOVOI SKHEMY OCHISTKI STOKOV),
Penzenskaya Bumazhnaya Fabrika 'Mayak Revolutsii' (USSR).
G. A. Neroslavskii.
Bumazhnaya Promyshlennost, No. 6, p 27-28, June, 1976. 1 fig, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Wastes, Industrial wastes, Water pollution sources, Foreign countries, Water purification, Suspended solids, Energy, Operating costs, Costs, Clays, Water pollution treatment, Industrial water, Water reuse.
Identifiers: *White water(Paper machines), USSR, Fiber recovery, Filler recovery.

The Mayak Revolyutsii paper mill (Soviet Union) produces an assortment of printing and writing papers. Because the papers are highly sized and filled (containing up to 13-14% kaolin), the effluents have a high concentration of suspended solids. In 1978 the mill will install a new effluent treatment system, in which the machine white water will flow into a storage tank and be reused in the pulpers. When not used for this purpose, the white water will flow into a conical settling tank. The system will increase the degree of fiber and filler recovery from 78% to 94-96% and reduce the solids content in purified water from 150 to 46 mg/liter. The recovered fibers are used in making the high-quality papers. Other advantages are reduced power consumption and operating costs and a reduction of suspended solids in the overall mill discharge from 582 to 293 mg/liter. (Stapinski-IPC)
W77-01644

IRRIGATION OF CORN WITH EFFLUENTS FROM FERMENTATION AND YEAST-PRODUCING PLANTS (OROSHENIE KUKURUZY STOCHNYMI VODAMI GIDROLIZNO-DROZHZHEVOGO PROIZVODSTVA),
I. I. Omel'chenko, and T. N. Khruslova.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No. 3, p 22-24, 1976. 4 ref, 4 tab.

Descriptors: *Corn(Field), *Irrigation, Effluents, *Fermentation, *Yeasts, Fertility, Wastes, Industrial wastes, Water pollution sources, Soil properties, Water pollution control, Crops, Crop production, Waste water disposal, *Water reuse.

Untreated and diluted (1:1 with fresh water) effluents from the Nikolaev fermentation and yeast-producing plant (which uses sunflower and rice husks and corn stalks as raw material) were used to irrigate corn fields. The effluents improved soil fertility, increased the corn yield, and improved the quality of the grain. On the basis of these results, it is recommended that diluted effluents be used for irrigation during the growing season and undiluted effluents for fall and winter irrigation during field plowing. A suitable dose is 500-1000 cu m/ha. Because of widely varying composition of fermentation plant effluents, the manner of using them and the rate of applications should be determined at each plant on the basis of chemical analyses. (Stapinski-IPC)
W77-01645

ADDITION OF PHOSPHORUS SALTS TO EFFLUENTS (DOBAVLENIE SOLEI FOSFORA V STOCHNYE VODY),
Tsentralnyi Nauchno-Issledovatelskii i Proektnyi Institut Lesokhimicheskoi Promyshlennosti, Khimki (USSR).
G. A. Ishcherikova, L. S. Kamyshanova, and N. P. Drozdov.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No. 3, p 11, 1976. 2 tab.

Descriptors: *Phosphates, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Neutralization, Lime, Hydrogen ion concentration, Calcium compounds, Phosphorus compounds, Salts, Chemical precipitation, Biological treatment, Aeration, Waste treatment, Water pollution treatment, Effluents, *Wood wastes.
Identifiers: *Pyrolysis.

At wood pyrolysis plants, the acidic effluents are neutralized with lime to a pH of 6.5-8.5, a process which results in the formation of soluble calcium salts, such as acetates. The precipitate is then separated from the neutralized effluent, soluble phosphorus salts (usually diammonium phosphate) are added, and the effluent is diluted and subjected to biological purification in aeration tanks. Because of the presence of calcium ions, little soluble calcium phosphates precipitate. The effect of the calcium ion concentration on the amount of soluble phoshates was investigated in model solutions and in the effluent of the Ashinsk wood-processing plant. The data show that the concentration of soluble phosphates depends directly on the concentration of calcium ions, and can be as low as 10% of the amount of the salt added. The higher the dilution of the effluent, the higher the concentration of soluble phosphorus. The phosphates should be added to the effluent after its dilution. (Stapinski-IPC)
W77-01646

BIOLOGICAL CLARIFICATION PLANT STARTED UP AT THE WIESLOCH CORRUGATED BOARD MILL (WELLPAPPE WIESLOCH NAHM BIOLOGISCHE KLAERANLAGE IN BETRIEB).
Neue Verpackung, Vol. 29, No. 7, p 727-728, July, 1976. 3 illus.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Foreign countries, Biological treatment, Water purification, Biochemical oxygen demand, Europe, *Sludge treatment.
Identifiers: Germany, Board mills.

The Attisholz-system two-stage activated sludge treatment (first stage, bacterial and fungal sludge: second stage, protozoan sludge) of the effluent at the corrugated board mill of Holfelder Werke GmbH and Company, Wiesloch, Germany, is briefly described. Five-day BOD is reduced from 1400 to 20 mg/liter. (Speckhard-IPC)
W77-01647

TREATMENT OF HEAVY METALS IN WASTEWATER,
Industrial Pollution Control, Inc., Westport, Conn.
K. H. Lanouette, and E. G. Paulson.
Pollution Engineering, Vol. 8, No. 10, p 55-57, October, 1976. 3 fig, 2 tab.

Descriptors: *Heavy metals, *Industrial wastes, *Separation techniques, *Waste water treatment, Effluents, Water pollution sources, Wastes, Waste treatment, Water pollution treatment, Chemical precipitation, Coagulation, Sedimentation, Filtration, Adsorption.
Identifiers: Chelates, Complex compounds.

Heavy metals can be present in waste water streams from industrial processes in free inorganic or complexed organic form. Free heavy metal concentration can be reduced to acceptable levels by precipitation from solution and separation from the water by coagulation and sedimentation or by filtration. Heavy metals in complexed organic form are usually treated first in order to release the heavy metal, which is then precipitated from solution, or alternatively, by removing the complex from solution by adsorption. (Witt-IPC)
W77-01649

PRELIMINARY STUDY OF PULP MILL EFFLUENT DECOLORIZATION BY THE METHOD OF SIMULTANEOUS COAGULATION (WSTEPNE BADANIA ODBARWIANIA SCIEKOW CELULOZOWYCH METODA KOAGULACJI SYMULTANICZNEJ),
Technical Univ. of Warsaw (Poland).
M. Apolinarski, M. Roman, E. Skowyrski, Z. Ulaska, and J. Zielinski.
Przeglad Papierniczy, Vol. 32, No. 5, p 157-162, May, 1976. 5 fig, 3 ref, 5 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Chemical precipitation, *Color, Wastes, Waste treatment, Industrial wastes, Water pollution treatment, Water pollution sources, Chemical oxygen demand, Activated sludge, Sedimentation, Biochemical oxygen demand, Coagulation, Water purification, Economics, Biological treatment, Foreign countries, Europe, Lignins.
Identifiers: Aluminum sulfate, Poland.

Despite the efficient operation of the effluent treatment system at the Ostroleka pulp mill (Poland), the purified effluents have a high COD and are strongly colored by non-biodegradable lignin compounds. Treatment of the effluents by the simultaneous coagulation method (i.e., the addition of coagulant to the aeration chamber of the biological purification plant) was studied in the laboratory to determine whether this method could achieve decolorization. The equipment consisted

essentially of an activated sludge chamber and a secondary sedimentation chamber. Determinations were made of the effect of various doses of aluminum sulfate on the reduction of COD, 5-day BOD, and color, and on the properties of the activated sludge. The coagulant dose ranged from 0 to 450 mg/cu dm. COD and color were reduced substantially, but only at the highest doses. At high coagulant doses, changes in the properties of the sludge occurred, including reduction of dehydrogenase activity and conversion of the sludge from predominantly bacterial to fungal. The reduction of BOD was about the same as in the absence of coagulant. The amount of excess sludge was increased due to precipitation of lignin. The purification process was sensitive to variations in effluent concentration. The simultaneous coagulation process is economical and effective for decolorization of effluents containing easily removable pollutants. For the case of the Ostroleka mill effluents, with high BOD and COD, a more economical solution includes separate coagulation before or after the biological treatment. (Stapinski-IPC)
W77-01650

DEWATERING OF ACTIVATED SLUDGE WITH FILTER BELT PRESSES,
Alton Box Board Co., Jacksonville, Fla.
V. L. Adams.
Tappi, Vol. 59, No. 9, p 54-56, September, 1976.

Descriptors: *Sludge treatment, *Dewatering, *Pulp wastes, *Activated sludge, Waste treatment, Solid wastes, Industrial wastes, Treatment facilities, Sludge, Polymers, Mixing, Waste treatment, Water pollution sources, Ultimate disposal, Filters, Conveyance structures.
Identifiers: Filter belt presses, Kraft mills, Board mills, Presses.

The gravity filter belt pressing system used by Alton Box Board Company (Jacksonville, Florida) to dewater sludge is described. Digested aerobic sludge from kraft pulp and paper mill effluents is pressed in D-J Sinus presses. The sludge enters a mixing tank where it is conditioned by polymers and mixing. It then flows from the mix tank onto the filter belt which conveys the sludge while allowing the water to drain. A series of plow and leveling rolls knead the sludge to aid in the dewatering. The filter belt then carries the sludge into the press section. Pressing is done by a solid neoprene belt that moves slightly faster than the filter belt. The sludge is removed by a doctor blade and falls into a screw conveyer for disposal. (Sykes-IPC)
W77-01651

COLOR REMOVAL IN A FERRIC CHLORIDE-LIME SYSTEM,
Institute of Paper Chemistry, Appleton, Wis.
H. S. Dugal, J. O. Church, R. M. Leekley, and J. W. Swanson.
Tappi, Vol. 59, No. 9, p 71-74, September, 1976. 4 fig, 4 tab.

Descriptors: *Pulp wastes, *Color, *Lime, *Waste water treatment, Chemical precipitation, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Sludge, Electrolytes, Bleaching wastes, Water pollution sources, Ions, Separation techniques, Iron compounds.
Identifiers: *Iron chloride.

Previous studies have shown that most of the color of kraft pulping wastes can be removed by precipitation with lime. It is shown in this study that over 50% of the color left by conventional lime treatment processes can be removed by incorporating certain polyvalent metal ions with lime. For example, additions of 100-300 ppm of ferric chloride with only 300-500 ppm of lime removed over 90% of the color from kraft pulp caustic bleach extract, compared to 72% removal with 600 ppm of lime only. More color was removed when the polyvalent metal ions were used with lime than when each was used individually, indicating that a synergistic effect existed. Below 1000 ppm of lime, the sludge obtained in this system settled slowly. (Sykes-IPC)
W77-01653

PURIFICATION OF PULP AND PAPER MILL EFFLUENTS BY RADIATION POLYMERIZATION. I. PURIFICATION WITH THE USE OF METHYL METHACRYLATE (OCHISTKA STOCHNYKH VOD PREDPRIYATII TSELLYULOZNO-BUMAZHNOI PROMYSHLENNOSTI METODOM RADIATSIONNOI POLIMERIZATSII. I. OCHISTKA S PRIMENENIEM METIL-METAKRILATA),
Belorussian State Univ., Minsk (USSR).
O. A. Gerasimovich, L. A. Kiseleva, A. V. Kireiko, A. M. Kovalevskaya, and E. P. Petryaev.
Vestsi Akademii Navuk Belaruskai SSR, Seryya Fizika-Energetychnykh Navuk, No. 3, p 33-37, 1975. 4 fig, 12 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Radiation, Wastes, Industrial wastes, Color, Lignins, Waste dilution, Biochemical oxygen demand, Hydrogen ion concentration, Water purification, Water pollution treatment, Water pollution sources, Waste treatment, Gamma rays, Laboratory tests.
Identifiers: *Methyl methacrylate, Black liquors, Kraft mills.

The purpose of this study was to develop suitable methods for radiation-chemical purification of kraft mill effluents, using methyl methacrylate as an additive. The laboratory study was conducted on solutions of kraft black liquor. Investigated were the effects (on the degree of color and lignin removal) of the gamma-ray irradiation dose, the methyl methacrylate concentration, and the black liquor concentration. Although the treatment is more effective in an atmosphere of nitrogen, irradiation was performed in air, i.e., under conditions similar to those used industrially. The effectiveness of the treatment increased with the dilution of black liquor and with the irradiation dose (up to 0.3 Mrad for a liquor concentration of 1%). Acidification of the liquor increased the degree of purification. The residual methyl methacrylate in the purified liquor (about 0.02%) did not affect BOD. The optimum conditions for the purification of a 1% solution of black liquor (approximating the concentration of digester room effluent) are a methyl methacrylate concentration not exceeding 1%, a radiation dose of about 0.2 Mrad, and a pH of 4-6, giving an 80-90% purification. (Stapinski-IPC)
W77-01655

USE OF OZONE IN A COMBINED SYSTEM FOR THE PURIFICATION OF KRAFT MILL EFFLUENTS (PRIMENENIE OZONA V KOMBINIROVANNOI SISTEME GLUBOKOI OCHISTKI STOCHNYKH VOD SUL'FATNO-TSELLYULOZNOGO PROIZVODSTVA),
Moskovskii Inzheniernyi-Stroitelnyi Institut (USSR).
Ya. A. Karelin, O. S. Khabarov, and Yu. P. Salamatov.
Vodnye Resursy, No. 3, p 137-140, 1975. 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Ozone, Toxicity, Effluents, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Chemical oxygen demand, Color, Hydrogen ion concentration, Phenols, Hydrogen sulfide, Organic compounds, Sulfur compounds, Toxins, Aquatic life, Water reuse, Economics, Foreign countries.
Identifiers: USSR, Condensates, Kraft mills.

Evaporator condensate, biologically purified effluent, and chemically purified effluent from the Baikal kraft mill (Soviet Union) were treated with ozone. The ozone treatment reduced the COD, color, and pH of all effluents and completely eliminated phenols, hydrogen sulfide, and organic sulfur compounds. Ozonization can be applied to all types of effluents and is particularly advisable for evaporator condensates. Ozonization did not produce any toxic substances that would affect aquatic life. The ozonized effluent can be recycled into production. On the basis of the results obtained in this study, technological processes were developed for the ozonization of evaporator condensates, for additional purification of chemically treated effluents, and for replacement of the chemical treatment stage by ozonization. Despite the additional costs for ozonization, the overall economic estimate is favorable, because of the recycling of a large amount of the effluents. (Stapinski-IPC)
W77-01656

MODERN METHODS OF PURIFYING PULP AND PAPER MILL EFFLUENTS (SOVREMENNYE METODY OCHISTKI STOCHNYKH VOD PREDPRIATII TSELLYULOZNO-BUMAZHNOI PROMYSHLENNOSTI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti, Leningrad (USSR); and Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidroliznoi Promyshlennosti, Moscow (USSR).
I. D. Tsvetkov, P. S. Varfolomeev, and N. E. Savgira.
Vodosnabzhenie i Sanitarnaya Tekhnika, No. 6, p 9-13, 1975. 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Water pollution control, Water purification, Efficiencies, Effluents, Recycling, Water reuse, Biological treatment, Color, Capital costs, Operating costs, Costs, Chemicals, Odor, Water pollution treatment, Waste treatment, Wastes, Industrial wastes, Pulp and paper industry, Energy.
Identifiers: Dry barking, Kraft mills, Continuous pulping, Condensates, Methanol, Turpentine, Fiber recovery, Oxygen-alkali bleaching.

In an attempt to reduce pollution of surface waters as well as the consumption of fresh water in the pulp and paper industry, new effluent treatment systems or modifications of the existing systems to improve their efficiency have been developed. These new systems and modifications are described and their expected effects are discussed. For example, switching to dry barking is considered, especially for large mills. At kraft mills, the proposed changes include a generalized use of continuous digesters, processing of foul smelling condensates with recovery of methanol and turpentine, recycling of purified effluents and recovered fibers, and use of oxygen-alkali stage in pulp bleaching. Water purification systems, including biochemical, chemical, and mechanical treatments and combinations of these treatments have been developed for paper and board mills utilizing groundwood, semichemical pulps and chemical pulps; new methods have also been proposed for decolorization of effluents and utilization of sediments formed during various treatments. A table is given showing estimated investment and operating costs of purification equipment per cu m of effluent per day for 5 mills producing effluents in different amounts and degrees of pollution, as well as the estimated consumption of power and chemicals. (Stapinski-IPC)
W77-01657

WATER IN GENERAL AND ITS INDUSTRIAL USE IN PARTICULAR (ALLGEMEINES UEBER DAS WASSER UND BESONDERES UEBER SEINEN INDUSTRIELLEN GEBRAUCH),
For primary bibliographic entry see Field 3E.
W77-01661

BLEACH MODIFICATIONS TO REDUCE POLLUTANTS,
Weyerhaeuser Co., Everett, Wash.
J. L. Morrison.

In: American Institute of Chemical Engineers, 80th National Meeting, Boston, Massachusetts, September 7-10, 1975, Paper No. 24D, 27 p. 13 fig, 21 ref, 1 tab.

Descriptors: *Bleaching wastes, *Pollutants, *Color, *Water pollution control, Water pollution sources, Wastes, Industrial wastes, *Chlorination, Equipment, Costs, Chemicals, Pulp and paper industry, *Waste water treatment.
Identifiers: *Hypochlorites, Alkaline extraction(Pulp), Chlorine compounds.

Reduction in pollutants, particularly in color substances, have been achieved by changing the conventional bleaching sequences, especially by using sequential in lieu of customary chlorination, and by substituting hypochlorite for the first alkaline extraction stage. The modified sequence can be used by existing bleach plants without equipment modifications at equivalent or only slightly higher chemical costs. (Brown-IPC)
W77-01663

USE OF CHLORINE DIOXIDE-ALKALI FOR HIGH-YIELD PULPING,
Institute of Paper Chemistry, Appleton, Wis.
G. A. Nicholls.
In: American Institute of Chemical Engineers, 80th National Meeting, Boston, Massachusetts, September 7-10, 1975, Paper 12F, 21 p. 5 fig, 11 ref, 3 tab.

Descriptors: *Water pollution control, *Pulp and paper industry, *Lignins, Water pollution sources, Alkalis(Bases), Odor, Bleaching wastes, Economics, Energy, Costs, Wastes, Industrial wastes, Effluents, *Waste water treatment.
Identifiers: *Chlorine dioxide, Delignification, Pulping processes, Fiberization.

Nonsulfur delignification of wood with chlorine dioxide plus alkali offers environmental (antipollution) advantages (no odor and no bleach plant effluent), but is presently economically disadvantaged, owing largely to high fiberization energy input and oxidant costs, since much of the chlorine dioxide is consumed in reacting further with lignin that has already been rendered alkali-soluble. (Brown-IPC)
W77-01664

AN OVERVIEW OF NEW PULP BLEACHING DEVELOPMENTS,
Hooker Chemicals and Plastics Corp., Niagara Falls, N. Y.
H. deV. Partridge.
In: American Institute of Chemical Engineers, 80th National Meeting, Boston, Massachusetts, September 7-10, 1975, Paper No. 24A, 28 p. 2 fig, 38 ref, 3 tab.

Descriptors: *Bleaching wastes, Research and development, *Water conservation, Chlorine, Ozone, Effluents, Oxygen, Biochemical oxygen demand, Color, Toxicity, Chlorides, Cellulose, Degradation(Decomposition), Water pollution sources, Wastes, Industrial wastes, Steam, Pumping, Energy, Diffusion, Pulp and paper industry, Water reuse, Effluents, Industrial water, *Waste water treatment.
Identifiers: *Pulp bleaching, Oxygen bleaching, Peroxide bleaching, Countercurrent washing, Diffusion bleaching, Chlorine monoxide(Hypochlorous acid anhydride), Wash water, Pulp washing.

Developments in pulp bleaching are strongly influenced by the need to utilize existing equipment and to minimize water and energy use in old mills, and to reduce capital and energy expenditures in new facilities. Promising new approaches using chlorine and chlorine derivatives include gas-phase and diffusion processes with various effluent recovery systems. Oxidative methods using oxygen, peroxides, or ozone are also reviewed. Countercurrent reuse of wash liquors can reduce effluent volumes perhaps as much as from 20,000 to 4,000 gal/ton of pulp. Diffusion bleaching promises to reduce this further to about 2,600 gal/ton with simultaneous reductions in steam consumption and pumping energy. Bleaching with molecular oxygen or the use of the Hooker antipollution sequences can drastically reduce bleaching effluent BOD, COD, color, toxicity, and chloride content. The effluent-free bleached kraft mill concept promises to find realization in the Rapson-Reeve system currently undergoing practical trials. The future of chlorine monoxide (hypochlorous acid anhyd ride) to bleach moist pulp is not yet clear, as it causes severe cellulose degradation. (Brown-IPC)
W77-01665

BARK AS NON-INERT TRICKLING FILTER MEDIUM FOR PULP MILL EFFLUENT,
Mississippi State Univ., Mississippi State. Dept. of Chemical Engineering.
G. R. Lightsey, and J. W. Mitchell.
In: American Institute of Chemical Engineers, 80th National Meeting, Boston, Massachusetts, September 7-10, 1975, Paper No. 36H, 35 p. 11 fig, 14 ref, 7 tab.

Descriptors: *Bark, *Trickling filters, *Pulp wastes, *Waste water treatment, Pine trees, Sludge treatment, Dewatering, Bleaching wastes, Biochemical oxygen demand, Chemical oxygen demand, Color, Electrical conductance, Soil amendments, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Wood wastes, Nitrogen, Filtration, Conductivity, Waste water disposal, Filters, Byproducts.
Identifiers: Kraft mills.

Pine bark from a kraft mill was examined for effectiveness as a sludge-dewatering and trickling filter medium. Eight filter models were tested with either primary sludge or bleach plant effluent from a kraft mill. Bark filter depths from 1 to 6 ft and hydraulic loading rates from 1.15 to 36.8 gal/sq ft/day were used. Results showed the bark filters to remove up to 95% of the BOD plus significant amounts of COD, color, and settleable matter. At the same time, the electroconductivity of the filtrate increased. Removal efficiencies did not change significantly after the liquid passed through about 3 ft of bark. The optimum loading rate for maximum BOD and COD percentage removal was 9.2 gal/sq ft/day, but higher hydraulic loadings gave greater total BOD and COD removals. After about 2-months use as a trickling filter medium, the nitrogen content of the bark (and hence its value as a soil conditioner) increased significantly. The filtered liquid was suitable for land disposal. (Brown-IPC)
W77-01666

TOXIC CONSTITUENTS IN WOODROOM EFFLUENTS,
B. C. Research, Vancouver (British Columbia).
For primary bibliographic entry see Field 5B.
W77-01667

DISPOSAL OF FLEXO INK WASHUP WASTE WATER,
P. F. Pratte.
Tappi C. A. (Committee Assignment) Report No. 51, p 81-82, 1975. 6 ref.

Descriptors: *Waste water treatment, *Chemical industry, Pulp and paper industry, *Flocculation, *Chemical precipitation, Wastes, Industrial wastes, Water pollution sources, Waste treatment, Filtration, Sedimentation, Water reuse, Water pollution treatment, Equipment, Design, Construction, Chemicals, Separation techniques, Adhesives, Effluents.
Identifiers: *Printing presses, *Wash water, Printing inks, Corrugated board, Box plants, Graphic arts, Paper converting industry, Packaging industry.

Brief descriptions are given of the Clearator, Expunger, Flexo-O-Kleer, and Color Tamer systems for clarifying flexographic press waste water from corrugated box plants. While different in design and construction, these systems are based on the same principle; chemicals are added to the effluent to flocculate and precipitate the residual ink and other substances so that they can be separated from the water by filtration and/or sedimentation. Reuse of the press wash water in the preparation of corrugating adhesive is also discussed. (Witt-IPC)
W77-01670

UDDEHOLM (FOREST INDUSTRIES) – KAMYR CLOSED BLEACHED PLANT (AT SKOGHALL, SWEDEN),
Uddeholm A. B. Skoghall (Sweden).
K. A. Anderson.
In: TAPPI Alkaline Pulping/Testing Conference, Dallas, Texas, September 13-15, 1976, Preprinted Proceedings. TAPPI, Atlanta, Georgia, p 191-195. 6 fig, 1 tab.

Descriptors: *Bleaching wastes, *Color, *Waste water treatment, Pulp and paper industry, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, *Pulp wastes, Chemical oxygen demand, Biochemical oxygen demand, Capital costs, Operating costs, Costs, Foreign countries, Effluents, Chlorine, Europe, Closed conduits.
Identifiers: Countercurrent washing, Pulp washing, Kraft mills, Sweden, Chlorine compounds, Closed systems.

Based on experience with full-scale decoloration (by adsorption on resin) of effluent from the first alkaline extraction stage, a process was developed for the treatment of total bleach plant effluents. The installation, designed to serve a 250 ton/day kraft bleach plant, has provided color reduction of about 90%, with 80% COD reduction and 50% reduction. Another significant feature of the process is tight countercurrent washing in the bleach plant. Effluent from the alkaline extraction stage is decolored and used as wash water in the chlorination stage. The input of chlorides is 10-12 kg or less, as NaCl per ton of pulp. Even low-molecular weight chlorine compounds are removed from the effluent. Investment and operating costs for the system are discussed; operating costs for fully bleached softwood kraft pulp are about $1.00 per ton of pulp. (Sykes-IPC)
W77-01671

TREATMENT OF CONTAMINATED CONDENSATES,
Sandwell International Inc., Portland, Oreg.
G. W. Hough, and R. W. Sallee.
In: TAPPI Alkaline Pulping/Testing Conference, Dallas, Texas, September 13-15, 1976, Preprinted Proceedings. TAPPI, Atlanta, Georgia, p 243-249. 7 fig, 3 ref, 3 tab.

Descriptors: *Pulp wastes, *Waste water treatment, Wastes, Waste treatment, Industrial wastes, Water pollution sources, Water pollution treatment, *Biochemical oxygen demand, Odor, Biological treatment, Sulfur compounds, Toxicity, Aerated lagoons, Activated sludge, Economics, Costs, Operating costs, Capital costs.
Identifiers: *Condensates, Black liquors, Terpenes, Air stripping, Steam stripping, Reduced sulfur compounds.

Digester relief and blow vapor condensates have a BOD ranging from 10 to 20 lb/ton of pulp, depending on wood species, type of pulp, and type of digester. The BOD of condensates from black liquor evaporation may range from 20 to 30 lb/ton of pulp, of which possibly 70% is contained in a third of the volume. These condensates are also rich in terpenes and odorous compounds and cannot be discharged without treatment for pollution abatement. Condensates can be treated to remove odorous compounds (air or steam stripping) or

BOD compounds (biological treatment or steam stripping). Steam stripping reduces the total reduced sulfur and the toxicity by more than 95%, and BOD by 60-85%, depending on the number of plates in the column and the ratio of steam to feed. Air stripping removes 90% or more of the total reduced sulfur and a significant amount of the toxicity, but reduces BOD by only 10-20%. Biological treatment in aerated lagoons or activated sludge systems is approximately 90% efficient in BOD removal. The economics of the different treatment processes are also discussed. (Sykes-IPC)
W77-01672

WHITEWATER SYSTEM CLOSURE IN NSSC CORRUGATING MEDIUM MANFACTURE,
Green Bay Packaging Inc., Wis.
J. E. Jayne, and G. O. Walraven.
In: TAPPI Alkaline Pulping/Testing Conference, Dallas, Texas, September 13-15, 1976, Preprinted Proceedings. TAPPI, Atlanta, Georgia, p 29-38. 10 fig, 2 ref, 1 tab.

Descriptors: *Water reuse, *Water conservation, *Pulp and paper industry, Water pollution sources, Water pollution control, Wastes, Reverse osmosis, *Recycling, Hardwood, Wisconsin, Pulp wastes, Operation and maintenance, Water balance, Recirculated water, Industrial water, Water utilization, Waste water treatment, Waste treatment, Water pollution treatment.
Identifiers: *Board mills, White water(Paper machines), Closed systems, Waste paper.

Green Bay Packaging Inc. (Green Bay, Wisconsin) produces 300 tons/day of corrugating medium from neutral sulfite semichemical (NSSC) pulp made from mixed hardwoods and from recycled box plant clippings. Over the last 5 years, the mill has been converted to an essentially closed white water system. Although almost all showers are fed with screened white water, the paper machine is a net consumer of water due to the higher consistency of stock leaving the digester area than entering the dryers. Many small dilute waste streams can be accepted in the recycle loop without upsetting the water balance. Any imbalance is corrected by reverse osmosis. Although most operating problems of reverse osmosis have been solved, flux rates are somewhat lower than had been predicted. The reduction of pollutant losses by capture and recycle results in a discharge of minimal ecological impact. (Sykes-IPC)
W77-01673

PROCESS OF EXTRACTION OF ORGANIC SUBSTANCES FROM PULP MILL EFFLUENTS (PROCEDE D'EXTRACTION DE SUBSTANCES ORGANIQUES D' EFFLUENTS D' USINES DE PATE DE BOIS).
French Patent No. 2,233,289, June 10, 1974. 7 p. 1 fig, 2 claims.

Descriptors: *Pulp wastes, *Color, *Bleaching wastes, *Patents, Separation techniques, *Ion exchange, Organic compounds, Wastes, Industrial wastes, Water pollution sources, Hydrogen ion concentration, Phenols, Resins, *Waste water treatment, Waste treatment, Water pollution treatment.

A process for extracting organic substances from pulp mill effluents using a bed of ion-exchange resin (preferably a phenolic resin with aminated functional groups) in a column involves activating the resin with an acidic solution and passing the effluent through the activated resin at a pH significantly higher than that of the liquid phase of the bed (preferably alkaline). In particular, variations in resin volume are avoided by intermittent additions of acidic solution during effluent treatment such that the pH of the liquid phase is periodically lowered. The process is particularly applicable to the decoloration of bleaching effluent. (Speckhard-IPC)
W77-01674

PROCESS AND INSTALLATION FOR DECOLORING WASTE WATERS (PROCEDE ET INSTALLATION POUR LE TRAITEMENT DE DECOLORATION D' EAUX USEES).
French Patent No. 2,235,091, June 26, 1974. 14 p. 3 fig, 10 claims.

Descriptors: *Bleaching wastes, *Pulp wastes, *Color, *Patents, *Filtration, *Calcium hydroxide, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Pulp wastes, Separation techniques, Water pollution treatment, Water pollution sources, Alkalis(Bases), Calcium compounds.
Identifiers: Kraft mills, Causticization, Green liquor(Kraft process).

A process for decoloring pulp mill effluents (particularly bleaching effluents from a kraft pulp mill) by filtration of the effluent through a bed of calcium hydroxide is characterized in that the calcium hydroxide bed is formed on a screen and is periodically renewed, the unused calcium hydroxide in the replaced bed being employed in the causticization of green liquor. (Speckhard-IPC)
W77-01675

METHOD OF PRODUCING CHAR FROM PULP MANUFACTURING WASTE LIQUOR,
Sanyo-Kokusaku Pulp Co. Ltd., Tokyo (Japan).
For primary bibliographic entry see Field 5E.
W77-01676

1975 REVIEW OF THE LITERATURE ON PULP AND PAPER EFFLUENT MANAGEMENT,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
G. Gove.
NCASI Stream Improvement Technical Bulletin, No. 284, 48 p, February, 1976. 236 ref.

Descriptors: *Reviews, *Waste water treatment, *Pulp wastes, *Bleaching wastes, *Water quality control, Pulp and paper industry, United States, Byproducts, Recycling, Water reuse, Water conservation, Industrial wastes, Industrial water, Color, Flotation, Coagulation, Biological treatment, Suspended solids, Sludge treatment, Aerated lagoons, Treatment facilities, Pollutant identification, Water pollution sources, Water analysis, Instrumentation, Effluents, Municipal wastes, Waste water(Pollution), Reverse osmosis, Activated sludge, Ultimate disposal, Biodegradation.

This annotated survey of publications on the U.S. paper industry's water quality control and waste treatment progress during 1974/1975 deals with the following topics: Pollutant sources and receiving waters; analytical procedures; disposal and recovery of spent pulping liquors (recovery of cooking chemicals and by-products); physicochemical treatments (waste water renovation and reuse, solids removal, color reduction, chemical coagulation, ultrafiltration and reverse osmosis, flotation, oxidation and stripping, sludge handling); and secondary treatments (activated sludge, aerated stabilization basins, joint municipal-industrial treatment, fixed-bed reactors, biodecomposition, pilot and laboratory studies). (Witt-IPC)
W77-01678

AN INVESTIGATION OF THE SEPARABILITY AND REUSE POTENTIAL OF THE ASH COMPONENT OF HIGH-ASH CONTENT PAPER MILL SLUDGES,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
A. M. Springer.
NCASI Stream Improvement Technical Bulletin, No. 285, 76 p, June, 1976. 5 fig, 10 ref, 29 tab.

Descriptors: *Sludge treatment, *Pulp wastes, Pulp and paper industry, Water pollution sources, Wastes, Industrial wastes, Sludge, Color, Brightness, *Waste treatment, Pigments, *Recycling, Pollution abatement.
Identifiers: Fillers, White water(Paper machine), Papermaking, Coated papers, Chemical recovery.

This report presents (1) the results of semi-pilot-scale studies of several means for separating the ash component from the fibrous organic portion of fine paper mill primary sludge, and (2) pilot-plant paper machine trials with the reuse of this material either as filler or coating pigment for filled and coated paper grades. Vibratory screening fractionated the sludge into a reusable high filler content fraction and a highly organic fraction. From 50 to 75% of the sludge may be reclaimed as reusable material. Although it caused some reduction in paper brightness, the possibility of brightening the recovered filler by oxidative bleaching appears encouraging. Wet oxidation also produced a reusable filler, which had less adverse effects on paper brightness than the screen-recovered product, but the wet-oxidized material was not suitable as a coating pigment. (Buchanan-IPC)
W77-01679

PLANNING FOR REGIONAL WASTE WATER SYSTEMS,
Massachusetts Dept. of Community Affairs, Boston.
T. R. Angotti.
Growth and Change, Vol. 6, No. 2, p 36-42. April 1975. 2 tab.

Descriptors: *Planning, *Waste water treatment, *Water quality, *Water pollution, *Social aspects, *Costs, *New Jersey, Waste disposal, Recreation, Benefits, Land use, Effluent.
Identifiers: Bergen County Sewerage Authority(NJ), North West Bergen County Sewerage Authority(NJ).

Questions concerning the effectiveness and scale economies of regional waste water systems, and the relationship between location, scale of waste water treatment and collective facilities and the structure of social and economic relations within the metropolitan region were investigated. The Hackensack drainage basin and its Bergen County Sewerage Authority (BCSA), a NJ portion of the New York City metropolitan area, were chosen for study. Large scale regional plans have been equated in the past with large-scale water treatment plants. It was found that the present regional system of BCSA was a major contributor to river pollution. A small regional waste water system, the N.W. Bergen County Sewerage Authority (NWBCSA), has maintained high levels of water quality. A decentralized system is recommended wherein costs and recreation benefits are equitably distributed, and strict surveillance of water quality in all portions of the basin can exist. Economies of scale were exhibited by the BCSA for both capital and operating costs, as well as for treatment plant and intercepting system costs. State and federal pollution control policies tended to support social class divisions and inequities in the distribution of wealth. A majority of water pollution control grants in NJ have been made to systems serving affluent suburban communities, neglecting inner cities where pollution problems are more severe and there is less ability to pay for water pollution control. In the study area, regional waste water systems were installed after growth had taken place rather than before so that capital costs were higher and the system was not used to guide development corresponding with a comprehensive land use plan. (Gentry-North Carolina)
W77-01690

REPORT OF RESEARCH AND RESEARCH NEEDS ON WATER QUALITY PROBLEMS IN THE STATE OF HAWAII,
For primary bibliographic entry see Field 5G.
W77-01698

MAGNETIZATION OF IRON CHROMIUM SYSTEM,
Ford Motor Co., Dearborn, Mich. (Assignee).
J. W. Butler.
U.S. Patent No. 3,960,723, 8 p, 4 fig, 3 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 947, No 1, p 307, June 1, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Metals, Ion exchange, Separation techniques, Chemical precipitation, Filtration.
Identifiers: Metal etching industry, Magnetized ferrous particles.

This invention relates to a process for treating aqueous waste solutions containing complexing or oxidizing agents and dissolved metallic elements of compounds of copper, chromium, nickel, lead or tin. The waste solution is treated with finely divided magnetized ferrous particles, continuing such treatment to allow for homogeneous stirring promoting substantial ion exchange between the solute and ferrous particles, and providing a post-treatment step using an agent to promote precipitation of metallic hydroxides. The precipitates are separated from the solution by deposition in a settling tank and/or filtration. (Sinha-OEIS)
W77-01709

TREATMENT OF CONDENSATES,
Societe d'Assistance Technique pour Porduits Nestle S.A., Lausanne (Switzerland). (Assignee).
T. Kleeman, and W. Rothmayr.
U.S. Patent No. 3,972,809, 4 p, 6 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 255, August 3, 1976.

Descriptors: *Patents, *Industrial wastes, *Organic wastes, *Water pollution treatment, Water pollution control, Water quality control, Water purification, Ion exchange, Resins, Chemical oxygen demand, Food processing industry, *Waste water treatment.
Identifiers: Coffee production.

A process for purifying an aqueous liquid resulting from the condensation of vapors emitted by an aqueous extract of a vegetable material is provided in which the liquid is treated with at least one ion exchange resin. The effluent obtained after treatment with the ion exchange resins may be either discharged as waste water or be utilized for the aqueous extraction of a fresh batch of vegetable material. This latter application is particularly advantageous with the production of extracts of vegetable materials such as coffee, chicory or tea. It has been found that utilizing the treated liquid leads to an improvement in the aromatic characteristics of the resulting product. The vapors emitted during evaporation entrain certain aromatic constituents of the plant material that were not removed during the preliminary stripping so that a portion of these constituents, present in the purified effluent, is re-introduced into the extraction cycle. Anionic or cationic ion exchange resins may be chosen from the resins industrially available. The appropriate quantity of resin is expressed as a proportion of the quantity of aqueous liquid to be treated and the amount of purity desired. The conditions of flow of the aqueous liquid through the ion exchange resin, provided that they represent a turbulence-free flow are not critical in relation to the process nor is the temperature of the treatment critical. (Sinha-OEIS)
W77-01716

FILTER, ESPECIALLY FOR BACK WATER,
Myrens Verksted A/S, Oslo (Norway). (Assignee).
P. J. Moe.
U.S. Patent No. 3,972,817, 6 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 258, August 3, 1976.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Pulp wastes, *Filtration, Water quality control, Water pollution control, Water pollution treatment, *Filters, Fibers, Pulp and paper industry.

The filter of this invention is of the type in which the static pressure in the liquid to be filtered can be more effectively utilized, so that it is not necessary to equip the filter with complicated suction means to achieve an effective filtration. The filter is characterized in that the vessel takes the form of a closed drum which is rotatably mounted about a horizontal central axis, and that the filter elements extend between and are connected to the end walls of the drum for rotation about the central axis together with the drum. The filter elements at one end extend through the end wall of the drum and since it is open at this end unobstructed discharge of the filtrate is permitted. A high average screening pressure differential and better screening capacity are achieved. A blow tube with nozzle means is provided within the filter element to remove solids from the filter surface when this element is above the liquid level in the drum. The filter is especially intended for the wood pulp industry, primarily for filtering of back water for recovering fibers and purifying the back water. However, it may also be used for thickening of pulp tec. Outside the wood pulp industry, the filter may be used e.g. as clean water filter and for recovery, purification and thickening of screenable suspensions in general. (Sinha-OEIS)
W77-01720

WATER RECYCLE TREATMENT SYSTEM FOR USE IN METAL PROCESSING,
Data General Corp., Southboro, Mass. (Assignee).
D. E. Hewitt, and T. J. Dando.
U.S. Patent No. 3,973,987, 6 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 949, No 2, p 673, August 10, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water pollution control, Water quality control, Industrial wastes, *Water reuse, Return flow, Filtration, Neutralization, Reverse osmosis, Evaporation, *Recycling.
Identifiers: Metal processing industry.

A water recycle treatment system is comprised of two main treatment sub-systems to separate out the impurities in contaminated water from concentrated solutions and rinse baths. A first sub-system treats less concentrated solutions used for rinse baths by channeling the flow to a first neutralizing tank which provides for pH control to produce a mixed output solution having a substantially constant pH factor. It is filtered to remove gross particles, cooled in a holding tank and then passed through a reverse osmosis process and carbon bed to produce clean water. The second sub-system treats highly concentrated solutions obtained from chemical processes, mixes them in a second neutralizing tank which is utilized to produce a substantially constant pH output. It is fed to an evaporator to precipitate the metals and salts in sludge and to form a water vapor output. The waste from the reverse osmosis process is processed in the second sub-system. (Sinha-OEIS)
W77-01724

PROCESS AND CYCLONE REACTOR FOR FIRE DECONTAMINATION OF INDUSTRIAL WASTE WATER CONTAINING ORGANIC AND REFRACTORY MINERAL IMPURITIES,
M. N. Bernadiner, A. A. Dobrovolsky, and B. S. Esilevich.
U.S. Patent No. 3,974,021, 7 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 949, No 2, p 684, August 10, 1976.

Descriptors: *Patents, *Industrial wastes, *Chemical wastes, Water pollution sources, *Pollution abatement, *Water pollution treatment, Burning, Incineration, *Waste water treatment.
Identifiers: Cyclone reactors.

A process is described for fire decontamination of industrial waste water containing organic and refractory mineral impurities. The waste water containing organic impurities and fusible mineral impurities is sprayed into a reactor which is maintained at a temperature which will burn out the impurities. A melt of fusible minerals is formed on the reactor walls. The waste water is fed into the reactor in such a manner that during the burning, the refractory mineral impurities penetrate the film of melt of fusible minerals and is discharged from the reactor. The reactor is provided in the top portion of its vertical cylindrical chamber with burner apparatus arranged tangentially to the chamber to create a whirling flow of combustion products. Injection nozzles for feeding waste water are arranged below the burners in at least two transverse planes. The injection nozzles in the upper plane are radially directed and adapted for feeding the waste water containing organic and fusible mineral impurities, and injection nozzles in the lower plane of the chamber are adapted for feeding waste water containing organic and refractory mineral impurities. The nozzles are directed at an angle with respect to the chamber walls so that the waste water is introduced into the whirling flow of combustion products. (Sinha-OEIS)
W77-01725

APPARATUS FOR REMOVING PARTICLES AND CHEMICALS FROM A FLUID SOLUTION,
M. L. Hulse.
U.S. Patent No. 3,975,257, 9 p, 7 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1105, August 17, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Chemical wastes, *Water pollution treatment, Water pollution control, Acidic water, Metals, Electric fields, Recycling, Water reuse, Equipment, *Electrolysis.
Identifiers: Metal etching industry, *Electrets.

The invention involves a method and apparatus for neutralizing etching agents, and separating metallic and fibrous particles and particulate matter from a fluid solution to reduce the particle level in the solution and condition it to permit its reuse in a manufacturing process and its ultimate disposal without adverse effects to the environment. A plastic material carrying an electrostatic charge, known as an electret, is placed in contact with the fluid solution. The particles which contact or come near the electret will adhere to its surface. The etching agents are neutralized by a chemical reaction with an arrangement of a metal element. The apparatus includes a receiving tank or container having its side walls formed from an electret material and having a series of baffles extending between the side walls and transverse to the path of flow. The baffles are also formed from the electret material. The fluid rinsing solution will be forced in circuitous and turbulent path through the container causing metal and particulate matter to settle out and a great percentage of particles to be removed by the electret material. The solution is discharged from the container into a filter having a generally cylindrical shell formed from similar electret means. From the filter, the solution may be recycled directly to the manufacturing process to be reused in washing the manufactured articles to remove metal chips etc. (Sinha-OEIS)
W77-01737

DEWATERING PROCESS,
S. S. Baize.
U.S. Patent No. 3,975,266, 4 p, 4 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1108, August 17, 1976.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Sludge treatment, Sludge disposal, Dredging, Separation techniques, Flocculation, *Dewatering, Centrifugation, *Water pollution treatment, Water pollution control.

A dewatering process for the separation and recovery of sludge from water reservoirs, such as lakes, ponds, lagoons, rivers and the like is provided. The process includes the steps of dredging the reservoir, thickening the suspended matter in the water, dewatering thickened matter and, then, recovering the sludge. The process further contemplates the addition of a flocculant to the dredged material between the dredging and thickening steps and/or between the thickening the dewatering steps. The invention is adapted for treatment of primary and secondary sludge and it is also amenable to treatment of activated sludge by providing an intermediate stage between the dewatering step and thickened matter recovery step. It further provides a two-stage process for introduction of the flocculant into the process stream. The two-stage process prevents degradation of the flocculant, especially where anionic or cationic polymeric flocculants are employed.
W77-01738

PURIFICATION OF INDUSTRIAL WASTE WATERS BY FLOTATION,
Swift Co., Chicago, Ill. (Assignee).
E. R. Ramirez.
U.S. Patent No. 3,975,269, 4 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1109, August 17, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water purification, Electrolysis, Bubble, Flocculation, Separation techniques, Foaming, *Flotation.
Identifiers: Microbubbles.

A method of purifying industrial waste water is disclosed where microbubbles consisting primarily of oxygen, hydrogen, or air having certain micron sizes and of sufficient number and volume are formed. Particles with or without the use of a coagulant in the water are attracted to the bubbles by difference in electrostatic charge to form embryo flocs. The addition of a polyelectrolyte is then made so that a full floc is formed which includes the microbubbles. This light floc is promptly surfaced by the buoyance factor provided by the microbubble. The process is suitable for all types of industrial waste water. Microbubbles are generated in the waste water system either by mechanical means or by electrolysis. A feature of this invention is that the flocculants are added only after the microbubbles have been formed and this condition leads to the formation of a final floc consisting of at least three phases; namely, a water phase, a gas phase (microbubbles) and, a floc phase consisting of metal hydroxides and foreign water impurities. (Sinha-OEIS)
W77-01740

PROCESS FOR RECOVERING USABLE OLIVE-PROCESSING LIQUOR FROM OLIVE-PROCESSING WASTE SOLUTION,
Department of Agriculture, Washington, D. C. Office of the Secretary.
R. Teranishi, and D. J. Stern.
U.S. Patent No. 3,975,270, 3 p, 12 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1109, August 17, 1976.

Descriptors: *Patents, Water pollution sources, *Food processing industry, *Water pollution control, *Pollution abatement, *Recycling, Sludge, Separation techniques, Water reuse, *Waste water treatment.
Identifiers: Lye, Olive processing.

The lye (or alkaline) solution employed in the initial soaking of fresh olives becomes contaminated with organic impurities. These impurities impart a deep brown color and an extremely unpleasant odor to the lye solution. Because the biological oxygen demand (BOD) of this waste is extremely high, it cannot be released into municipal sewage treatment systems without first being diluted with enormous quantities of water. The invention provides a means for obviating the problem and the contaminants in the lye solution may be removed so that the purified liquor can be recycled. After olives are soaked in and removed the lye solution, the liquid is directed to a tank where lime is added. The contents are stirred for a short period and then charcoal is added to the slurry and stirring is continued for approximately 15-30 minutes. At this point calcium carbonate is added to the stirred slurry. Stirring is continued and then the slurry is pumped to another tank where the slurry is allowed to settle. Usually, complete settling takes place in about 30 minutes to an hour. The liquor is removed from the settled contaminants and is ready for reuse. Only the settled contaminants (sludge) must be disposed of and since the volume of waste is small, disposal is not difficult. In fact it may be used as fertilizer because it contains only organic contaminants, the lye having been removed and recycled. (Sinha-OEIS)
W77-01741

PROCESS FOR STERILIZING WATER BY THE COMBINATION OF CHLORINE AND ANOTHER HALOGEN,
For primary bibliographic entry see Field 5F.
W77-01742

MODULAR AERATOR AND SEPARATOR ASSEMBLY FOR SEWAGE TREATMENT FACILITY,
L. A. Schmid.
U.S. Patent No. 3,975,276, 7 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1111-1112, August 17, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Water pollution control, Water quality control, Aeration, Separation techniques, Turbulence, Diffusion, Equipment, *Treatment facilities.

An efficient, modular, drop-in type aeration and separation assembly for use in relatively small sewage treatment facilities is disclosed which includes perforated aeration conduits or diffusers placed adjacent the sewage inlets of the apparatus for inducing an upwards directed hydraulic suction or 'pumping action' which serves to increase the turbulence and aeration of sludge and other solid entering and collected within the unit. The assembly includes a multi-tube particulate removal unit which effectively removes entrained solid from sewage passing upwards in conjunction with an inverted V-shaped grease collector positioned below the multitube separator which also serves as an air diffuser to facilitate selective air cleaning of the latter. Air conduit means are provided for the selective delivery of compressed air beneath the grease collector for even diffusions and the conduit also permits suction removal of grease or the like trapped within the collector so that the assembly can be easily cleaned without the necessity of shutting down the overall treatment facility for extended periods. (Sinha-OEIS)
W77-01743

METHOD OF BIOLOGICAL PURIFICATION OF SEWAGE,
Akvadan A/S (Denmark). (Assignee).
B. K. Tholander, and S. Krarup.
U.S. Patent No. 3,977,965, 9 p, 18 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 949, no 5, p 2024, August 31, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, *Water purification, Biological treatment, Anaerobic conditions, Aerobic conditions, Aeration, Mixing, Separation techniques, Denitrification.

A method of biological purification of sewage in a purification plant uses three tanks, of which at least two sequentially serve as a feeding tank for the sewage and one as a clarification tank. The sewage at any time is subjected to an aerobic treatment by means of aeration and simultaneous circulation of the sewage. It was found that due to the fact that at least two tanks are used alternatively as feeding tanks and between these periods are being used for aerobic treatment, a considerable amount of sewage, which during apreceding step of the method has been subjected to an aerobic treatment and also to a nitrification, will be present in the tank when it is used as a feeding tank and, accordingly, the nitrates produced may be reduced by the microorganisms. Moreover, the growth of such microorganisms will be supported by the fresh organic materials added to the tank. Therefore good biological purification will be achieved. As each tank discharges liquid corresponding to the amounts of liquid supplied, all tanks work with the same degree of filling. Due to the fact that a tank is always driven aerobically after an anaerobic period and before it is used as clarification tank, a decomposition of organic materials is always secured. (Sinha-OEIS)
W77-01746

PURIFICATION OF NON-BIODEGRADABLE INDUSTRIAL WASTEWATERS,
Sterling Drug Inc., New York. (Assignee).
L. A. Pradt, and J. A. Meidl.
U.S. Patent No. 3,977,966, 6 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 949, no 5, p 2024, August 31, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, *Oxidation, Separation techniques, *Activated carbon, Biological treatment, Heat, Pressure, Chemical oxygen demand, Water reuse.
Identifiers: *Wet oxidation, Regeneration.

A process for treating nonbiodegradable industrial wastewaters comprises subjecting the wastewater to wet oxidation at a temperature between 150 and 375 deg. C. and a pressure between 150 and 4000 psig so that a reduction of between 30 and 99 percent in chemical oxygen demand is obtained, separating the gaseous, liquid and solid phases. The liquid phase is oxidized in an aeration contact tank containing a biomass suitable to effect biological oxidation of the organic solutes present in the liquid phase while maintaining powdered activated carbon in the aeration contact tank in an amount sufficient to enhance the bio-oxidation and substantially reduce the odor and color. The biological oxidation is carried out until excess biomass builds up and the activated carbon becomes spent. Then a mixture of the excess biomass and spent carbon is transferred to a wet oxidation reactor and the mixture is oxidized under conditions similar to those used for the wet oxidation of the wastewater so as to regenerate the powered activated carbon for further use in the biological oxidation step and at the same time disposing of the excess biomass. (Sinha-OEIS)
W77-01747

ION EXCHANGE REGENERATION,
Nalco Chemical Co., Oak Brook, Ill. (Assignee).
For primary bibliographic entry see Field 5F.
W77-01748

SEPARATION CHAMBER, HOLDING TANK, DRAINAGE SYSTEM,
R. M. Purcell.
U.S. Patent No. 3,977,978, 8 p, 9 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 949, No 5, p 2029, August 31, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Sewage treatment, *Domestic wastes, Septic tanks, Drainage water, Soil disposal fields, Waste disposal, Water pollution sources.

This invention involves a superimposed separation chamber, holding tank, drainage system in which

modular units are stacked one on top of the other to form a drainage system covered by a holding tank and topped off by one or more annular separation chambers. One or more drainage rings, open at their tops and bottoms and each with a number of large apertures through their walls are stacked to form the drainage system. A cone shaped louver, also open top and bottom, is fitted in each drainage ring. The holding tank is stacked on top of the uppermost drainage ring to separate the drainage system from the septic tank and is formed with a sludge accumulating basin. One or more annular separation chambers is then stacked on top of the holding tank. Each annular separation chamber is subdivided by divider walls each decreasing in height in a predetermined fluid flow direction, and with every other one of the divider walls provided with an upward angled pipe. (Sinha-OEIS)
W77-01750

PROCESS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS,
Ciba-Geigy Corp., Ardsley, N. Y. (Assignee).
H. Wegmuller, and J. Haase.
U.S. Patent No. 3,979,285, 9 p, 12 ref; Official Gazette of the United States Patent Office, Vol 950, no 1, p 262, September 7, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, *Water purification, Absorption, Cellulose, Color, Chemical precipitation, Pulp and paper industry, Textiles.
Identifiers: Leather industry, *Decolorization.

The invention relates to a process for the purification of industrial effluents, especially for the decolorization of waste liquors arising in the textile, paper and leather industry in which the effluents are brought into contact with cellulosic absorbent which has been pretreated with precipitants. The effluents which result from dyeing, washing and tanning processes are brought into contact in the undiluted state with cellulose material pretreated with precipitants. The cellulose to be used as carrier material consists of bleached or unbleached spruce sulphite cellulose, Kraft cellulose or waste sheets from printing. Suitable precipitants are in principle compounds which are adsorptively bound by the cellulose and which at the same time exert a precipitating or retaining action on the residual substances. In this respect, water-soluble basic aminoplasts such as formaldehyde-dicyandiamide condensation products have proved suitable. (Sinha-OEIS)
W77-01757

APPARATUS FOR THE PURIFICATION OF EFFLUENT,
Societe Anonyme pour l'Etude et l'Exploitation des Procedes Georges Claude, Paris (France). (Assignee).
P. Boulenger.
U.S. Patent No. 3,979,293, 6 p, 1 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 950, no 1, p 265, September 7, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water pollution control, *Water purification, *Oxygenation, *Activated sludge, Mixing, Equipment, *Biological treatment.

A process is provided for the purification of effluent using an oxygen-rich gas in which the effluent is mixed with a biologically activated sludge. The effluent/sludge mixture thus obtained is oxygenated and then is introduced into a treatment zone in which a quantity of activated sludge is fixed on vertially disposed, mobile discs immersed with the treatment zone and a further quantity of activated sludge is in suspension in the effluent undergoing treatment. The injection of oxygenating gas is preferably effected through the lower portion of part of the oxygenation zone, in which the direction of mass flow is upwards. In this way, the oxygenating gas which is injected acts as a 'gaslift' which is utilized as a mechanical means for introducing the effluent/sludge mixture to the treatment zone. (Sinha-OEIS)
W77-01760

ENTERIC VIRUS SURVIVAL IN PACKAGE PLANTS AND THE UPGRADING OF THE SMALL TREATMENT PLANTS USING OZONE,
Kentucky Water Resources Research Inst., Lexington.
L. S. Cronholm, J. K. McCammon, M. Fleischman, J. R. Perrich, and V. Riesser.
Research Report No. 98, November 1976. 109 p., 23 fig., 24 tab., 42 ref. OWRT A-059-KY(1). 14-31-0001-5017 14-31-0001-6018.

Descriptors: *Waste water treatment, Water quality, *Ozone, Treatment facilities, *Viruses, Kentucky, *E. coli, *Disinfection, Microorganisms, Enteric bacteria, *Chlorination.
Identifiers: Ozonation, *Enteric viruses, Poliovirus.

Post-chlorinated effluent collected with a portable viral concentrator from four treatment plants in Jefferson County, Kentucky, yielded infective viral particles from three plants from spring through late fall. The pH, chlorine, turbidity, and coliform levels of these effluents indicated that viral persistence was correlated with inefficient processing which produced effluent environments that inhibited disinfection by chlorine. The disinfection potential of ozone was tested on secondary effluents and finished water seeded with poliovirus and Escherichia coli. Low doses of ozone inactivated viruses and bacteria in treated water, but not in effluent. The inactivation of bacteria by ozone does not appear to be caused by cell lysis. Inability of poliovirus to form plaques correlated with inhibition of capsid penetration. Electron micrographs revealed that ozone degraded capsids. Ozonation produced low levels of COD and TOC reduction in package plant effluent. Since the reaction rates were not a simple function of COD levels and ozone dose it would be difficult to standardize dose rates. The relative inefficiency of ozone in reduction of biological and nonbiological pollutants in effluents, combined with its high cost, does not favor a recommendation for ozonation as a tack-on process.
W77-01809

A ROTATING FLIGHTED CYLINDER FOR SOLID-LIQUID SEPARATION AND BIOLOGICAL WASTE TREATMENT,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
J. R. Miner.
Oregon Water Resources Research Institute, Corvallis, Completion Report WRRI-48, September 1976. 73 p, 25 fig, 18 tab, 5 ref, 2 append. OWRT A-031-ORE(2).

Descriptors: *Waste treatment, *Separation techniques, *Farm wastes, *Sedimentation, *Biological treatment, Treatment facilities, Equipment, Performance, Operations.
Identifiers: *Solid-liquid separation, *Rotating flighted cylinders.

A single device for solid-liquid separation and biological waste treatment was designed, built, and evaluated. The device, a rotating flighted cylinder, consists of a cylindrical tube which has a helically wound fin mounted perpendicular to the interior surface. When mounted at a slight incline (7 to 15 degrees) and slowly rotated (1 to 3 rpm), the device provides a mechanism to accomplish sedimentation between wraps of the fin. The settled solids are augered toward the upper end and discharged as a solids-rich stream. The fin surfaces, alternately exposed to the waste and the atmosphere, perform conversion of soluble organic matter to bacterial cells in a manner similar to rotating disk processes. Overall, the rotating flighted cylinder was demonstrated to be a simple, low cost, low energy-consumptive device for the treatment of small domestic and agricultural waste flows. Where a temporary or seasonal treatment unit is needed, it has some particular advantages over conventional package plants.
W77-01815

RECREATIONAL REUSE OF MUNCIPAL WASTEWATER -- PHASE II,
Texas Tech Univ., Lubbock. Water Resources Center.
M. Headstream, R. M. Sweazy, D. M. Wells, and R. C. Baskett.
Interim Report WRC-76-2, April 1976. 84 p, 25 fig, 2 tab, 67 ref. OWRT C-6053 (No. 5205) (1).

Descriptors: *Water reuse, *Phosphorus, *Eutrophication, *Recreation, Lakes, *Algae, *Nutrients, Cycling nutrients, *Texas, Municipal water, Ponds.
Identifiers: *Lubbock(Tex), Canyon Lakes project(Tex), *Multiple reuse of municipal wastewater, Algal growth.

Impending water shortages through the southwestern United States have provided the impetus for the conception and implementation of various water reuse plans. A leader in this area is Lubbock, Texas. The city has been using its treated municipal effluent for irrigation purposes for over 35 years and is now in the process of making a second reuse of the wastewater. A series of recreational lakes being built in Yellowhouse Canyon, north and east of the city, will be fed with reclaimed percolated effluent. Recognizing the potential problems inherent in recreational reuse projects, a model of the Canyon Lakes Project consisting of nine common-wall concrete ponds was constructed. The makeup water for the ponds was recovered percolated effluent of comparable quality to that which will be used in the actual project. The model system provided an excellent opportunity for ascertaining the suitability of reclaimed percolated municipal wastewater for recreational purposes, as well as an opportunity for more clearly defining the role of phosphorus in an aquatic environment. Researchers conducted studies relative to water quality, algal growth and control, suitability of the water for fish life and recreational contact, critical phosphorus levels, and the factors affecting the availability of phosphorus for algal growth. The results not only will be of value to the City of Lubbock in helping to maintain an aesthetically pleasing system of lakes but also will be applicable to the successful operation of other warm water impoundments in the southern United States. (See also W75-01853 and W74-01103)
W77-01824

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PILOT STUDY, FIVE INDUSTRIES,
Conference Board, Inc., New York.
For primary bibliographic entry see Field 5G.
W77-01959

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, CHEMICAL AND ALLIED INDUSTRIES,
International Research and Technology Corp., Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-01960

WATER POLLUTION CONTROL ACT OF 1972, COSTS AND CAPABILITIES, WATER TREATMENT SYSTEMS,
American Water Works Association Denver, Colo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 039.

Price codes: A04 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/103, July 1975, 67 p. WQ5AC094.

Descriptors: *Water treatment, *Waste water treatment, Water pollution, Federal Water Pollution Control Act, Economics, Forecasting, Water quality, Cost analysis.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

An assessment is made of the anticipated impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on water treatment system requirements and costs. In the aggregate, the cost to the majority of water utilities that stand to benefit from the law far outweighs the gain. In the opinion of many water utility and state regulatory officials, implementation of the effluent guidelines as proposed is not cost effective in the majority of cases. Only a small percentage of water utilities that reported an improvement in water quality also reported a reduction of costs. The financial benefits expected to accrue from implementation of the act are essentially insignificant. (NCWQ)
W77-01963

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, PUBLICLY OWNED TREATMENT WORKS, (VOLUMES 1, 2 AND 3).
Metcalf and Eddy, Inc., Boston, Mass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 690, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/43, March 1976, 1,404 p.

Descriptors: *Combined sewers, *Waste water treatment, *Construction costs, *Treatment facilities, *Operating costs, *Capital costs, Rainfall, *Estimated costs, Runoff, Sewers, *Pollution abatement, Sewage treatment, Sludge disposal, Water pollution control, Water quality.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

An assessment of the state-of-the-art of technology has shown that municipal needs for wastewater collection and treatment can be met. Construction of additional facilities required by 1990 entails a capital cost of $62 billion (June, 1973 dollars) and 150 million man-days of on-site manpower. The increase in annual operation and maintenance requirements between 1972-1973 and 1990 involves an estimated cost of $1.2 billion (92% increase), manpower of 14 million man-days (53%) and electrical energy consumption of 10 billion kilowatt-hours (150%). Discharges of BOD and suspended solids in 1990 will be 60% and 55% less than in 1972-73, respectively. Raw sludge production will increase by at least 5 million tons (dry solids) per year (110%+). Eight strategies for controlling combined sewer overflows were formulated with capital costs of $1.2 to $68 billion and 1990 operation and maintenance costs of $46 to $400 million per year. Estimates of resources and residuals were prepared. (NCWQ)
W77-01982

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, STEAM ELECTRIC POWER INDUSTRY, (VOLUME 1, 2 AND 3).
Taknekron, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 5G.
W77-01983

DISPOSAL OF WASTEWATER RESIDUALS, (VOLUMES 1 AND 2).
Environmental Quality Systems, Inc., Rockville, Md.
For primary bibliographic entry see Field 5E.
W77-01984

THE METSEP PROCESS FOR THE SEPARATION AND RECOVERY OF ZINC, IRON, AND HYDROCHLORIC ACID FROM SPENT PICKLE LIQUORS,
National Inst. for Metallurgy, Johannesburg (South Africa).
T. H. Tunley, P. Kohler, and T. D. Sampson.
Journal of the South African Institute of Mining and Metallurgy, Vol. 76, No. 10, p 423-427, May, 1976. 3 fig, 10 tab, 1 ref.

Descriptors: *Waste water treatment, *Chemical industry, *Byproducts, Reclamation, Acids, *Zinc, Ion exchamge. *Separation techniques, Chemical reactions, Liquid wastes, Industrial wastes, Chemical wastes, Treatment facilities, *Iron.
Identifiers: *Hydrochloric acid recovery, Pickle liquors.

The Metsep Process for recovering hydrochloric acid from spent pickle liquors contaminated with appreciable concentrations of zinc chloride (up to 100 grams/liter) is described along with the installation of a spray roaster which incorporates this process. The process involves contacting the zinc-contaminated spent pickle liquor with a weak-base ion-exchange resin in a continuous countercurrent ion exchange plant working on the Cloete-Streat principle in order to separate the zinc from iron chloride which is also present in the spent liquor. In a liquid-liquid extraction plant, the zinc ion (Zn (++)) is then reacted with di-2-ethyl-hexyl-phosphoric acid solvent to form a complex and hydrochloric acid. The hydrochloric acid is removed in the raffinate, and the loaded solvent is contacted with strong sulfuric acid to form zinc sulfate, with the solvent being converted into its original form. Satisfactory operation of a spray roaster plant incorporating the Metsep Process has been achieved since coming into full operation in 1973. (Kreager-FIRL)
W77-01987

DYE CATALYZED OXIDATION OF INDUSTRIAL WASTES,
Alaska State Dept. of Environmental Conservation, Juneau.
J. W. Sargent, and R. L. Sanks.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 102, No. EE5, p 879-895, October, 1975. 11 fig, 1 tab, 25 ref.

Descriptors: Chemical industry, *Waste water treatment, *Oxidation, *Photoactivation, *Dyes, Chemical reactions, *Phenols, Aerobic conditions, Kinetics, Feasibility studies, *Industrial wastes, *Chemical wastes.
Identifiers: *Cresols.

The effectiveness of dye-sensitized aerobic photooxidation as a waste water treatment technique was investigated, with particular emphasis on the photooxidation of phenol and cresol using visible light. Dye-sensitized aerobic photooxidation was achieved by employing conventional methods of aeration, mixing, and handling of waste streams. Tungsten incadescent lamps proved to be an effective light source, and methylene blue and Rose Bengal were the most effective dye sensitizers. Although the rate of dye-sensitized aerobic photooxidation decreased with increasing liquid layer thickness, significant substrate destruction was achieved with a liquid layer thickness of almost 2 in. Both cresol and phenol were destroyed by dye-sensitized aerobic photooxidation, with the former being destroyed faster than the latter; the optimum initial cresol concentration for maximum rate of aerobic photooxidation sensitized by 5 milligrams/liter of methylene blue was about 50 milligrams/liter (minimum cresol half-life was 2.45 minutes). Dye sensitized aerobic photooxidation appears to be a potentially valuable waste water treatment technique based on the above findings. (Kreager-FIRL)
W77-01988

KODAK DISPOSES OF WASTE IN SYSTEM THAT HELPS PAY ITS WAY,
R. A. Young, and I. O. Lisk.
Pollution Engineering, Vol. 8, No. 9, p 48-49, September, 1976. 1 fig.

Descriptors: *Sludge treatment, *Solid wastes, *Industrial wastes, *Incineration, *Reclamation, Byproducts, Symbiosis, Treatment facilities, Chemical industry, Chemical wastes, Waste disposal, *Waste treatment, Recycling.
Identifiers: *Photography processing wastes recovery.

An Eastman Kodak combustible waste disposal unit that reclaims heat, produces steam, and recovers silver is described. A refuse handling section of the system has the capacity to break up as many as 180 tons/day of paper, packaging wastes, and general plant trash from four of Kodak's manufacturing plants. A sludge drying section which uses its own heat flash dries sludge from Kodak's waste water treatment plant. A combustion section generates steam for plant operations by burning the refuse and sludge in a suspension-fired boiler. Approximately 77,000 pounds/hour of steam are produced as a byproduct of the refuse combustion, and the steam is used to drive a turbine which generates electricity for the plant. Silver is recovered from bottom ash in the boiler and from flyash collected by an electrostatic precipitator. About 30 tons/day of the ash are generated and treated for silver recovery. (Kreager-FIRL)
W77-01989

YEAST PLANT WASTEWATER TREATMENT,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
Y. C. Wu, and C. F. Kao.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 102, No. EE5, p 969-984, October 1976. 7 fig, 4 tab, 12 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Food processing industry, *Feasibility studies, *Biological treatment, Industrial wastes, Liquid wastes, Color, Kinetics, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Organic compounds, Efficiencies, *Yeasts.

The feasibility of treating yeast plant waste water in a 2-stage activated sludge process (completely mixed, continuous flow) was investigated along with the effectiveness of using alum for color removal. At an initial organic loading rate of 0.32 pounds 5-day biochemical oxygen demand/day/pound mixed liquor volatile suspended solids, the 2-stage activated sludge process with detention times of 6 and 18 hr in the 1st and 2nd stages, respectively, removed approximately 96.0%, 77.8%, and 99.3% of the total 5-day biochemical oxygen demand, chemical oxygen demand, and suspended solids, respectively, and produced an effluent containing 74 milligrams/liter 5-day biochemical oxygen demand, 1600 milligrams/liter chemical oxygen demand, and 34 milligrams/liter of suspended solids. However, dilution and pH adjustment to neutral were required before treatment. The 2-stage activated sludge process produced the following biokinetic properties in the 1st and 2nd stages, respectively, on a 5-day biochemical oxygen demand basis: maximum specific growth rates of 1.23 and 1.14/day, saturation constants of 554 and 610 milligrams/liter, and cell yield coefficients of 0.944 and 0.700. Although alum was useful for color removal, the effective dosage required was high. The 2-stage process appears to be superior to conventional 1-stage activated sludge processes with respect to organic substrate and suspended solids removals. (Kreager-FIRL)
W77-01990

PHYSICAL-CHEMICAL METHODS FOR THE RECOVERY OF PROTEIN FROM WASTE EFFLUENT OF POTATO CHIP PROCESSING,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
E. Meister, and N. R. Thompson.
Journal of Agricultural and Food Chemistry, Vol. 24, No. 5, p 919-923, September/October, 1976. 3 fig, 5 tab, 21 ref.

Descriptors: *Food processing industry, *Waste water treatment, *Proteins, *Reclamation, *Byproducts, Nutrients, Chemical precipitation, Flocculation, Foods, Heat, Sedimentation, Centrifugation, Acidity, Chemical reactions, Separation techniques, Efficiencies, *Industrial wastes, Liquid wastes.
Identifiers: *Potato chip processing wastes recovery.

Simple physical-chemical methods for recovering protein from potato chip processing waste effluent were evaluated. Sedimentation or centrifugation after heating, pH adjustment, or both yielded similar amounts of protein. A daily recovery of about 170 kg of dried potato protein (550 kg of food containing 30% protein) was estimated as being feasible based on the operations of an average potato chip plant processing 31 metric tons of potatoes/day. Heat (80-90 C) at pH's of 4-4.5 was the most effective treatment for protein recovery, but total dry matter reduction was greatest if no heat was applied. Protein yields were improved if the waste was kept in motion during floc formation. Ferric chloride compared favorably with hydrogen chloride as a coagulant for protein precipitation. An estimated 30-40% of the crude protein and 80-90% of the coagulable protein which is presently being wasted appears to be recoverable. (Kreager-FIRL)
W77-01991

NEW DEVELOPMENTS IN UTILIZATION OF WASTES FROM FOOD INDUSTRY PLANTS.
Bulletin of the Institution of Engineers (India), Vol. 25, No. 10, p 58, April, 1976.

Descriptors: *Food processing industry, *Byproducts, *Water reuse, *Nutrients, *Reclamation, Symbiosis, Nitrogen, Reverse osmosis, *Waste water treatment, Industrial wastes.

Developments in the utilization of wastes from various food industries are reported. Water extracts of lime mud, a waste product obtained in the production of protein hydrolysate, can be used as a supplementary source of nitrogen in the production of yeast. The reflux obtained during the production of citric acid can be added to molasses (maximum dose of 100% in relation to the molasses) to increase the yield of yeast used for commerical bakery purposes by some 8%. Approximately 70 kilograms of commercial yeast can be obtained from 1 ton of post citric acid reflux. Reverse osmosis can be used to reclaim concentrated waste water generated by yeast prodcution plants. (Kreager-FIRL)
W77-01992

DISTILLERY WASTES AS FERTILIZER.
Bulletin of the Institution of Engineers (India), Vol. 25, No. 10, p 50, April, 1976.

Descriptors: *Food processing industry, *Water reuse, *Waste water disposal, *Fertilizers, *Nutrients, Agriculture, Irrigation, Nitrogen, Phosphorus, Potassium, Biochemical oxygen demand, Byproducts.
Identifiers: *Distillery wastes.

The use of distillery waste water for the fertilization and irrigation of cane crops is discussed. Its use in this context simply requires proper dilution, and cane crops irrigated by the diluted effluent require no additional fertilizer over the entire cultivation period. A mixed fertilizer with a nitrogen: phosphorus: potassium ratio of 12:5:3.5 can be obtained by mixing in 2:1:1 (by weight) proportions of the following ingredients: dry solids of distillery effluent, bone meal or single superphosphate, and urea or ammonium sulfate. The characteristics of the distillery effluent should be: pH 3.0-5.4, total solids 0.16-10.4%, ash 0.02-2.2%, potash 0.13-0.72%, biochemical oxygen demand 10,000-73,000 mg/liter, phosphorus 0.1-1.0%, and nitrogen 0.01-1.5%. (Kreager-FIRL)
W77-01993

VISCOUS PRODUCT FROM ACTIVATED SLUDGE BY METHANOL FERMENTATION,
Agricultural Research Service, Peoria, Ill. Northern Regional Research Lab.
E. N. Davis, and L. L. Wallen.
Applied and Environmental Microbiology, Vol. 32, No. 2, p 303-305, August, 1976. 1 tab, 9 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Sludge treatment, *Food processing industry, *Reclamation, *Beneficiation, Alcohols, Microorganisms, Physical properties, Chemical properties, Byproducts, Agriculture, Domestic waste, Industrial waste.
Identifiers: *Methanol fermentation.

The aeration of activated sludge generated from a waste disposal plant handling mixed domestic and industrial (mostly agribusiness) wastes with 3-4% methanol additions for 5-7 days yielded an odorless, highly viscous (5000-10,000 centipoise), black, pudding-like product containing glycans linked other than alpha-1-4 or beta-1-3. Backseeding gave maximum thickening in 3-4 days. Incomplete acid hydrolysis of the black product gave a 0.27% solution of reducing sugars (75% glucose) which amounted to an 11.4% yield from the added methanol. Backseeding into either centrifuge supernatant or 0.1% yeast extract in tap water gave a light-colored polymer. Viscosity decreased during extended sterile cold storage. A 5% salt addition lowered viscosity by one-half. From 6-12 colony types appeared on plating backseeded media, but none of these isolates was a reliable polymer former. The beneficiated activated sludge may have other value besides its use as a source of methane fuel in anaerobic digesters. Such potential uses include: glucose recovery, the incorporation of a dried film of the sludge with pesticides for their slow release, and the coating of seedling roots to prevent dehydration. (Kreager-FIRL)
W77-01994

REMOVAL OF POTASSIUM FROM SUGAR INDUSTRY BY-PRODUCTS.
German Patent DS 1692-451. Issued July 29, 1976. Derwent German Patents Abstracts, Vol. X, No. 32, p C1, July 29, 1976.

Descriptors: *Food processing industry, *Waste water treatment, *Byproducts, *Separation techniques, *Potassium, Reclamation, *Patents, Recycling.

A patent for a process to remove potassium from water liquors generated by yeast production so that the liquors can be used in animal fodders is descsribed. The concentrated molasses is treated with excess sulfate or sulfuric acid at 70-75C; and on cooling to 30C over a 10-hour period, potassium sulfate crystallizes out and is removed by filtration or centrifugation. (Kreager-FIRL)
W77-01995

STEEL-PLANT STACKGAS CLEANUP: AN ATTRACTIVE ROLE FOR MAGNETISM,
L. J. Ricci.
Chemical Engineering, Vol. 83, No. 19, p 114, 116, September 13, 1976. 2 fig, 2 ref.

Descriptors: *Gases, *Metals, *Waste treatment, *Magnetic studies, *Separation techniques, Mineral industry, Waste water treatment, Solid wastes, Phosphates, Oil wastes, Dusts, Efficiencies, Pilot plants, Industrial wastes.
Identifiers: Magnetic separation.

The potential of high-gradient magnetic separation for removing magnetic materials from basic oxygen furnace stack gas is discussed. The magnetic separator device consists of a canister packed with fibers of a ferromagnetic material. The housing is subjected to a strong external magnetic field, and magnetic forces produced at the fibers' edges capture micron-size paramagnetic particles flowing counter-currently to the field. Overall collection efficiency varies with magnetic field, fiber diameter, packing density, mesh, length and magnetization, particle magnetic susceptibility and diameter, and gas viscosity and superficial velocity. Collection efficiencies better than 90% can be achieved for basic oxygen furnace dusts at particle sizes down to about 0.3-0.4 micron. Other possible applications include: cleaning steel mill and electroplating waste waters, removing particles from oils and hydraulic fluids, coal desulfurization, and the removal of solids and dissolved orthophosphates from municipal waste water. An Environmental Protection Agency sponsored pilot project involving the use of high-gradient magnetic separation for stack gas cleanup is currently underway, and commercialization could take place in the early 1980's. (Kreager-FIRL)
W77-01996

REMOVAL OF HEAVY METALS FROM INDUSTRIAL EFFLUENTS,
National Enforcement Investigations Center, Denver, Colo.
J. V. Rouse.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 102, No. EE5, p 929-936, October, 1976. 1 fig, 2 tab, 14 ref.

Descriptors: *Heavy metals, *Neutralization, *Sorption, *Chemical precipitation, *Ion exchange, *Reverse osmosis, Separation techniques, Industrial wastes, Chemical wastes, *Waste water treatment.
Identifiers: Cementation.

Techniques for the removal of heavy metals from industrial effluents are reviewed. Neutralization is the most widely used technique for removing dissolved heavy metals. The substance used for neutralization varies and can include lime, ground or crusted limestone, caustic, soda ash, or anhydrous ammonia. Heavy metals removal can also be achieved by sulfide precipitation, utilizing either inorganic sulfide, hydrogen sulfide gas or sulfide generated by anaerobic organic activity. Sorption techniques, utilizing either prepared sorption media for recovery and reuse or low-cost absorption media for single use, can also be used for heavy metal recovery. A recently patented system for metals removal in the fabric dyeing industry uses a prepared belt of peat. Cementation, a process widely used in the copper mining industry where dissolved copper is removed from solution by exchange with iron, offers a means of substituting a less toxic metal for a more toxic one. Reverse osmosis and ion exchange are attractive where water quality requirements dictate high quality effluent or in cases where there is a market for a high quality water for use as process or potable water. Coprecipitation is especially effective for radium removal; the principle involved in this case is the precipitation of barium sulfate with the coprecipitation of radium sulfate. (Kreager-FIRL)
W77-01997

FOAMY COMPLEX FORMATION FOR REMOVING AND RECOVERING OF HEAVY METAL IONS IN DILUTE SOLUTIONS WITH N-MONODECANOYL DIETHYLENETRIAMINE,
Government Industrial Research Inst., Nagoya (Japan).
G. Izumi, M. Sato, S. Shoji, and K. Oikawa.

Bulletin of the Chemical Society of Japan, Vol. 49, No. 7, p 1727-1731, July, 1976. 9 fig, 4 tab, 9 ref.

Descriptors: *Heavy metals, *Separation techniques, *Foam separation, *Waste water treatment, *Industrial wastes, Zinc, Cadmium, Copper, Lead, Iron, Metals.

A modified foam separating technique using the fatty compound N-monodecanoyl diethylenetriamine is described for the selective removal of various heavy metals from waste water. The fatty agent forms soluble and foamy complexes with the metals, thus allowing for their separation from aqueous media. The addition of 200 ppm of the fatty compound to a mixed solution of copper sulfate, lead nitrate, and zinc sulfate (equivalent to a mixture of 10 ppm of each metal ion) followed by foam treatment at various pH values resulted in a nearly 100% separation of copper ions at pH 6, 70% lead ions at pH 7, and about 98% zinc ions at pH 9. Foam treatment beginning at pH 9 resulted in the simultaneous recovery of more than 96% of all heavy metal ions. Tests with real waste water demonstrated the successful removal of zinc, cadmium, copper, lead, and iron. Electrolysis can be used to regenerate the fatty compound after its complexation with the metals to be removed. (Kreager-FIRL)
W77-01998

ELECTROCHEMISTRY,
Southampton Univ. (England). Dept. of Physical Chemistry.
G. Hills.
Chemistry in Britain, Vol. 12, No. 9, p 291-293, September, 1976. 6 fig, 4 ref.

Descriptors: *Electrochemistry, *Electrodialysis, *Electrodes, *Waste water treatment, *Desalination, Heavy metals, Organic compounds, Ion exchange, Brackish water, Industrial wastes, Chemical wastes, Liquid wastes, Adsorption, Inorganic compounds, Salts.
Identifiers: Pyridine.

The use of three-dimensional packed bed electrodes for the removal of inorganic and organic compounds from aqueous solutions is discussed. An electrochemical cell with a porous carbon granule electrode whose potential with respect to the solution can be made sufficiently cathodic so as to electroplate out a wide range of toxic heavy metal ions is illustrated. Removal efficiencies of greater than 99% are possible. Metals deposited onto the carbon bed can be rapidly unloaded by reversing the polarity of the bed. Dissolved organic materials can be adsorbed and desorbed from a graphite electrode by alternating the electrode potential from the potential of zero charge to either anodic or cathodic extremes. Using solutions of pyridine (40 ppm) in dilute aqueous potassium chloride, an adsorption efficiency of nearly 100% was initially achieved; however, it steadily declined as the graphite surface became saturated. A combination of electrodialysis and mixed bed ion-exchange is illustrated for the desalination of brackish water. The resin bed, whether packed or fluidized, maintains the conductivity of the electrodialysis cell even when the concentration of the influent solution falls to 10 ppm. (Kreager-FIRL)
W77-01999

THE EFFECT OF GAMMA IRRADIATION ON PULP AND PAPER MILL EFFLUENTS,
Tokyo Univ. (Japan). Dept. of Forest Products.
G. Meshitsuka, and J. Nakano.
Applied Polymer Symposium, No. 28, p 1321-1330, 1976. 10 fig, 9 ref.

Descriptors: *Pulp wastes, Pulp and paper industry, *Waste water treatment, *Lignins, *Degradation(Decomposition), *Gamma rays, Radiation, Waste treatment, Effluents, Color, Dissolved oxygen, Aeration, Bubbles, Chemical oxygen demand, Industrial wastes, Chemical wastes.

The effect of gamma irradiation on the decomposition of lignin in pulp and paper mill effluents was investigated using lignosulfonate, thiolignin, and various kraft mill effluents. Irradiation was performed with gamma rays from cobalt 60 sources of 12,000 and 17,000 curies. Gamma irradiation in combination with air bubbling (dissolved oxygen) resulted in the radiolytic degradation of the aromatic nucleus of the lignin molecule. The addition of small amounts of alcohols, sodium acetate, and peroxides accelerated the radiolytic brightening of lignin, whereas iron addition had a detrimental effect. Studies with kraft mill effluents revealed that gamma irradiation, even without air bubbling, was effective in reducing the chemical oxygen demand and color content of both the chlorine stage and the total effluent. However, for the caustic extraction stage effluent, air bubbling was found indispensable for complete decoloration and chemical oxygen demand decrease. Color removal and chemical oxygen demand decrease were difficult to achieve in the screen washing effluent even when air bubbling was used. (Kreager-FIRL)
W77-02000

CONTINUOUS TREATMENT OF WOOL WASH LIQUID - EFFICIENCY INCREASED BY SUPPLEMENTARY CLOSED CONTAMINANT TREATMENT CIRCUIT LINKED TO LIQUID CLEANING CIRCUIT.
Soviet Patent SU-481-550. Issued January 16, 1976. Derwent Soviet Inventions Illustrated, Vol. X, No. 34, p D5, September 29, 1976. 1 fig.

Descriptors: *Patents, *Textiles, *Waste water treatment, *Industrial wastes, *Separation techniques, Filtration, Filters, Cyclones, Heat exchangers, Heat transfer, Liquid wastes, Efficiencies, Water reuse, Recycling.
Identifiers: Textile industry.

A patent for an apparatus that continuously treats wool wash liquid is described that utilizes a supplementary closed contaminant treatment circuit to increase efficiency and bulk. The closed cleaning system consists of a series of filters, hydrocyclones, heat exchangers, a thermal drier, and conveyors. A supplementary closed contaminant treatment and vapor generation circuit which consists of a worm mixer, the thermal drier, and the conveyor is connected to the liquid cleaning circuit by a drier, with the discharge being connected to the worm mixer and the receiving part to the hydrocyclone. The steam generating circuit consists of a series arrangement of the gas-steam separator, a condenser, the thermal jacket of the hydrocyclone, and the worm heat exchanger connected to the thermal drier. (Kreager-FIRL)
W77-02002

REMOVING POLYVINYL ALCOHOL FROM TEXTILE FINISHING WASTE WATER - BY ADDING A BINDER, E.G., A SALT OR FORMALDEHYDE, TO INSOLUBILISE THE POLYMER.
Belgian Patent BE-839-217. Issued July 1, 1976. Derwent Belgian Patents Abstracts, Vol. X, No. 31, p D2, September 8, 1976.

Descriptors: *Patents, *Textiles, *Alcohols, *Waste water treatment, *Separation techniques, Solubility, Chemical wastes, Liquid wastes, Industrial wastes, Polymers, Binders, Efficiencies.
Identifiers: Polyvinyl alcohol, Textile industry.

A patent for a process that removes polyvinyl alcohol as a solid and insoluble product from textile finishing waste water is described. The process involves adding a binder to the liquid waste in order to make the polyvinyl alcohol insoluble. The binder is preferably any of the following: ammonium sulfate, anhydrous sodium carbonate, borax, formalin, or a salt solution. The patent claims four different embodiments of the process. The treatment process results in 100% polyvinyl alcohol recovery without sludge formation. (Kreager-FIRL)
W77-02003

LONG-TERM BIODEGRADABILITY OF TEXTILE CHEMICALS,
Clemson Univ., S.C. Dept. of Textiles.
J. J. Porter, and E. H. Snider.
Journal Water Pollution Control Federation, Vol. 48, No. 9, p 2198-2210, September, 1976. 18 fig, 10 ref.

Descriptors: *Textiles, *Biodegradation, *Biological treatment, *Waste water treatment, *Industrial wastes, *Chemical wastes, Biochemical oxygen demand, Chemical oxygen demand, Dyes, Solvents, Degradation(Decomposition), Performance, Chemical reactions, Effluents, Evaluation, Organic compounds.
Identifiers: Kerosene, Textile industry, Textile finishes, Textile sizings.

Data from 30-day biochemical oxygen demand studies of several textile chemicals (hydrocarbon solvents, dyes, textile finishes, and sizings) are reported and compared with the chemical oxygen demand of the sample. The data indicate that many textile chemicals degrade slowly and continue to consume oxygen after 30 days; thus, a 5-day biochemical oxygen demand test cannot be used to measure the ultimate biochemical oxygen demand of such chemicals and should be coupled with the chemical oxygen demand test so that the total organics in the waste will be measured and compared with the fraction that is degradable. The fact that kerosene, for example, has 5-day and 30-day biochemical oxygen demands of 13,000 and 28,000 mg/liter is evidence of its poor degradability when compared with the chemical oxygen demand requirement of 2.5 million mg/liter. Many dyes are also resistant to degradation and show little color change after 30 days. If the fraction of organics that is degraded in 5 days is low, an assessment of the treatment system should be made to see if physical or chemical treatment methods can be utilized more efficiently than biological waste treatment. (Kreager-FIRL)
W77-02004

LAUNDERING AND DRY-CLEANING,
N. S. Whittall.
In: Textile Progress, Vol. 8, No. 2, p 1, 22-23, 1976.

Descriptors: *Laundering, *Waste water treatment, *Reclaimed water, *Water reuse, *Industrial wastes, Liquid wastes, Recycling, Symbiosis, Reclamation, Oxidation, Organic compounds, Filtration, Treatment facilities, Aeration, Heat exchangers, Heat transfer, Effluents.

A system for reclaiming laundry effluent is described. Used water from the washers flows over a heat reclaimer made of copper coils and the cooled water then enters a settling tank via a series of filters which remove large insoluble matter. Sump pumps circulate the water through diffusing devices where it is subjected to air for oxidation of organic matter. The aerated water then passes through additional filtration chambers and is finally pumped back through the heat reclaimer to the main hot water tanks. Thus, the volume of water discharges is reduced, heat is recovered, and the quality of the effluent is improved. (Kreager-FIRL)
W77-02005

TREATING WASTES FROM E.G., SLAUGHTER HOUSES, TANNERIES - BY PASSING THROUGH ELECTROLYTICALLY PRODUCED FINE BUBBLES INTO FLOTATION TANK.
French Patent FR 2287-422. Issued June 11, 1976. Derwent French Patents Abstracts, Vol. X, No. 30, p D4, May 7, 1976.

Descriptors: *Patents, *Tannery wastes, *Wastes water treatment, *Separation techniques,

*Bubbles, *Flotation, Electrolysis, Chemical wastes, Industrial wastes, Aggregates.
Identifiers: Slaughterhouse wastes, Tanneries.

A patent for a process which treats industrial wastes from tanneries and slaughterhouses is described. The waste is passed through a compact and dense zone of fine bubbles which are produced electrolytically. The aggregates formed by the bubbles and waste are directed into a flotation tank where the aggregates rise to the surface and are separated. This produces extremetly fine bubbles and very active seed floccules consisting of bubbles adhering to waste particles. (Kreager-FIRL)
W77-02007

ON SPENT LIQUOR OF SEMICHEMICAL PULPING (V). IMPROVEMENT OF THE COLOR REMOVAL EFFICIENCY BY THE PHOTOCHEMICAL TREATMENT (SCP HAIEKI NI TSUITE (V). SHIGAISEN SHORI NI OKERU SHOSHA KORITSU NO KOJO),
S. Meguro, K. Sameshima, M. Sumimoto, and T. Kondo.
Kamipa Gikyoshi (Japan Tappi), Vol. 30, No. 8, p 444-449, August, 1976. 6 fig, 1 tab, 8 ref.

Descriptors: *Pulp wastes, Pulp and paper industry, *Color, *Ultraviolet radiation, *Waste water treatment, *Oxygenation, Temperature, Chemical wastes, Acidity, Alkalinity, Additives, Chemical oxygen demand, Efficiencies, Industrial wastes.

Factors affecting the efficiency of ultraviolet radiation-induced color removal from spent liquor generated during semichemial pulping were investigated. The photochemical efficiency of color removal was increased by oxygen- and air-bubbling and changes in pH and temperature. Oxygen bubbling exerted the strongest influence of color removal efficiency. A color removal of 90% and a chemical oxygen demand decrease of 40% were accomplished when irradiation was carried out at a pH of 12 and a temperature of 60 C along with oxygen bubbling for about 2 hours. The use of chemical additives to increase color removal efficiency at room temperature and at acidic and alkaline pH values was also investigated. The addition of 25 ppm of rose bengal and periodate at pH values of 12 and 5 resulted in a 90% color removal; the addition of acetyl acetone and hydrogen perodide at a pH of 5 also resulted in color removals of 90%. (See also W76-09338; W74-09454; and W73-15189) (Kreager-FIRL)
W77-02008

STORMWATER STUDIES AND ALTERNATIVES IN ATLANTA,
Jordan, Jones, and Goulding, Inc., Atlanta, Ga.
For primary bibliographic entry see Field 5B.
W77-02073

5E. Ultimate Disposal Of Wastes

HYGIENIC EVALUATION OF THE STATE OF PROTECTION OF A WATER BODY FROM POLLUTION IN THE REGION OF AN INDUSTRIAL COMPLEX, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 5D.
W77-01555

MUNICH'S CONTRIBUTIONS TO SEWAGE, FISHERY AND STREAM BIOLOGY, VOL. 26. WATER FOR LAND RECLAMATION AREAS, (IN GERMAN),
Bayerische Biologische Versuchsanstalt, Munich (West Germany).
For primary bibliographic entry see Field 5D.
W77-01598

DEWATERING OF ACTIVATED SLUDGE WITH FILTER BELT PRESSES,
Alton Box Board Co., Jacksonville, Fla.
For primary bibliographic entry see Field 5D.
W77-01651

CONSIDERATIONS FOR LAND DISPOSAL OF PAPER AND PULP MILL SLUDGE,
W. M. Perpich.
Tappi, Vol. 59, No. 9, p 56-57, September, 1976. 4 ref.

Descriptors: *Sludge disposal, *Pulp and paper industry, *Landfills, Solid wastes, Sludge, Physical properties, Chemical properties, Leachate, Geology, Hydrogeology, Land use, *Waste disposal, Ultimate disposal.

Considerations for disposal of pulp and paper mill sludge by landfilling which are discussed include a knowledge of the physical and chemical characteristics of the sludge, a leachate study of the sludge, knowledge of the geological and hydrogeological features of the proposed landfill site, and a final use plan for the site after abandonment. (Sykes-IPC)
W77-01654

DISPOSAL OF FLEXO INK WASHUP WASTE WATER,
For primary bibliographic entry see Field 5D.
W77-01670

METHOD OF PRODUCING CHAR FROM PULP MANUFACTURING WASTE LIQUOR,
Sanyo-Kokusaku Pulp Co. Ltd., Tokyo (Japan).
T. Norita, H. Ibara, M. Murakami, and M. Okano.
United States Patent No. 3,971,705. July 27, 1976, 5 p, 1 fig, 4 claims.

Descriptors: *Byproducts, *Patents, *Pulp wastes, *Activated carbon, Ultimate disposal, Carbon, Effluents, Water pollution sources, Wastes, Industrial wastes, Heat treatment.
Identifiers: *Destructive distillation, Paper, Paperboard.

A method of treating spent pulping liquors to form a carbonized solid of use in making activated carbon comprises confining the spent liquor in a container and feeding the container into an air-heating furnace so that the container is contacted countercurrently with heated air, without rotating or stirring the container or its contents, at 200-400C for over 30 minutes. The container may be made of paper or paperboard, in which case the container itself is carbonized during the process and becomes part of the carbonized solid product. (Lynch-IPC)
W77-01676

PLANNING FOR REGIONAL WASTE WATER SYSTEMS,
Massachusetts Dept. of Community Affairs, Boston.
For primary bibliographic entry see Field 5D.
W77-01690

REPORT OF RESEARCH AND RESEARCH NEEDS ON WATER QUALITY PROBLEMS IN THE STATE OF HAWAII,
For primary bibliographic entry see Field 5G.
W77-01698

METHOD AND APPARATUS FOR CONTROLLING THE DISCHARGE OF CONTAMINANTS FROM SHIPS,
For primary bibliographic entry see Field 5G.
W77-01732

DEWATERING PROCESS,
For primary bibliographic entry see Field 5D.
W77-01738

PROCEDURES MANUAL FOR MONITORING SOLID WASTE DISPOSAL SITES,
Wehran Engineering Corp., Middletown, N. Y.
For primary bibliographic entry see Field 5B.
W77-01774

A ROTATING FLIGHTED CYLINDER FOR SOLID-LIQUID SEPARATION AND BIOLOGICAL WASTE TREATMENT,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W77-01815

DISPOSAL OF WASTEWATER RESIDUALS, (VOLUMES 1 AND 2).
Environmental Quality Systems, Inc., Rockville, Md.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 371, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/79, March 1976. 1,031 p.

Descriptors: *Sludge disposal, *Waste water disposal, *Waste treatment, Ultimate disposal, Waste disposal, *Waste water treatment, Incineration, Federal Water Pollution Control Act, Air pollution, Water pollution control, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

An evaluation was made of the impact to the nation and 'minimum geographical areas' of the disposal of residues produced from wastewater treatment required to meet goals of Water Pollution Control Act Amendments of 1972 (P.L. 92-500). Land disposal of sludges and treated effluent were emphasized. Incineration and ocean disposal of sludges were also considered. Based on a review of residue production by treatment or manufacturing processes, municipal and industrial residue generation rates and locations were estimated. Impacts on natural vegetation, wildlife and groundwater were evaluated for land disposal techniques. Impacts on air quality were evaluated for incineration of sludge as well as air stripping for ammonia removal from sewage. Ocean disposal was considered both in general and with emphasis on the New York Bight. Local impacts of land disposal could be controlled and minimized with careful site selection and development and carefully controlled application rates. Incineration and air stripping systems can cause air pollution problems if not properly designed, located and operated. (NCWQ)
W77-01984

KODAK DISPOSES OF WASTE IN SYSTEM THAT HELPS PAY ITS WAY,
For primary bibliographic entry see Field 5D.
W77-01989

DISTILLERY WASTES AS FERTILIZER.
For primary bibliographic entry see Field 5D.
W77-01993

VISCOUS PRODUCT FROM ACTIVATED SLUDGE BY METHANOL FERMENTATION,
Agricultural Research Service, Peoria, Ill. Northern Regional Research Lab.
For primary bibliographic entry see Field 5D.
W77-01994

A MODEL FOR CALCULATING EFFECTS OF LIQUID WASTE DISPOSAL IN DEEP SALINE AQUIFERS, PART I--DEVELOPMENT.
Geological Survey, Austin, Tex.

For primary bibliographic entry see Field 5B.
W77-02010

WASTEWATER STORAGE-SIMULATION OF INSTREAM EFFECTS,
Kentucky Dept. for Natural Resources and Environmental Protection, Frankfort.
For primary bibliographic entry see Field 5B.
W77-02074

5F. Water Treatment and Quality Alteration

TRANSFORMATION OF CHEMICAL SUBSTANCES IN WATER BODIES AND DURING WATER TREATMENT AS A HYGIENIC PROBLEM, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
A. A. Korolev, and V. T. Mazaev.
Gig Sanit 7, p 83-88, 1975.

Descriptors: *Water treatment, *Chemical reactions, *Chemical degradation, Toxicity, Odor, Color, *Chemical properties, Public health, Food chains.

Transformation of a chemical substance in water reduces its concentration and changes its chemical nature; weakening or intensification of toxicity, disappearance or appearance of odor, taste and color, degradation or accumulation of the substance and its transformation products in water, even incorporation in food chains can result.
W77-01552

EFFECTIVENESS OF METHODS OF IMPROVING DRINKING WATER QUALITY (FLUORIDATION, DESALINATION, MAGNETIC TREATMENT, ETC., (IN RUSSIAN),
Meditsinskii Institut, Saratov (USSR).
E. V. Shtannikov.
Gig Sanit 7, p 25-29, 1975.

Descriptors: Potable water, *Fluoridation, Pesticides, *Desalination, Electrodialysis, *Pesticide removal, *Ion exchange, Human diseases, Hardness(Water), Separation techniques, Resins, *Water treatment.
Identifiers: Arthritis, Caries, Lithiasis, *USSR, *Magnetic treatment.

Fluoridated water is effective in dental caries prevention in children and adolescents in the USSR. Water desalinated by electrodialysis has no adverse effect on experimental animals or humans. People who consume highly mineralized hard water over long periods of time get arthritis, nephrolithiasis and cholecystolithiasis. Magnetic treatment of waters whose carbonate hardness amounts to more than half of the total hardness is effective. Water treated by a magnetic field with a strength of not more than 2000 Oersted is safe for the health of the population. The combined use of coagulants and flocculants with subsequent filtration of the treated water through sand is especially useful for inactivating pesticides. The use of ion-exchange resins can reduce the concentration of pesticides in water by 95-100%.
W77-01558

TREATMENT OF POTABLE WATER UNDER FIELD CONDITIONS. EXPERIENCE FROM THE SECOND WORLD WAR, (IN RUSSIAN),
T. I. Golubev.
Gig Sanit 5, p 22-24, 1975.

Descriptors: *Potable water, *Water treatment, *Coagulation, *Chlorination, Bioindicators, Bacteria.
Identifiers: Russian-SFSR, USSR, *Izhora River(USSR), *Leningrad(USSR).

Provision of troops with potable water during World War II from a water treatment plant in Kolpino on the Izhora River outside of Leningrad (Russian SFSR, USSR) is described. The entire water treatment process (coagulation and chlorination) was carried out simultaneously in the same vessel and the water could be used without filtration after appropriate settling. Physicochemical and bacteriological indices of the water from the Izhora River (on June 15, 1942) are given.--Copyright 1976, Biological Abstracts, Inc.
W77-01576

EFFECT OF ABATE (DIPHOS) ON THE GENERAL SANITARY CONDITIONS OF WATER BODIES: II, (IN RUSSIAN),
For primary bibliographic entry see Field 5D.
W77-01607

PLANNING FOR REGIONAL WASTE WATER SYSTEMS,
Massachusetts Dept. of Community Affairs, Boston.
For primary bibliographic entry see Field 5D.
W77-01690

PROCESS FOR PURIFYING TAP WATER,
I. V. Popov, G. R. Bochkarev, V. F. Lebedev, and F. A. Baryshnikov.
U.S. Patent No. 3,974,070, 5 p, 1 fig, 3 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 949, No 2, p 699, August 10, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, Flocculation, Electrolysis, Filtration, Alkaline earth metals, Potable water, Water supply.

A process for purifying tap water comprises filtration of the water with impurities flocculated by a metal hydroxide produced electrolytically in the same water, through a layer of a solid water-insoluble granular material. The water containing a metal hydroxide is passed continuously through a layer of granular material in such a manner that metal hydroxide is deposited on the surface of the granular material in the direction of water flow forming an additional filtering layer. The metal hydroxide is an active flocculating agent for the finest disperse particles and possesses a high water-penetrating ability, so that the use of a metal hydroxide in the form of a water-penetrating layer having a high adsorption activity makes it possible to efficiently perform a continuous process of water purification.
W77-01726

WATER CONDITIONING DEVICE,
Marian Co., Chicago, Ill. (Assignee).
L. D. Dunn, and J. Shields.
U.S. Patent No. 3,974,071, 4 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 949, No 2, p 699, August 10, 1976.

Descriptors: *Patents, *Scaling, *Corrosion control, *Water treatment, *Water quality control, Inhibitors, Alloys, Equipment.
Identifiers: *Water conditioning, Configuration.

The efficiency of a corrosion and lime scale inhibitor for use in a water conditioning device can be appreciably improved by providing the inhibitor with an improved configuration and by causing the inhibitor to churn the water as the water flows through the casing. Additionally, the inhibitor has a non-oxidized or 'machined' surface in lieu of the oxidized surface of a sand casting causing the activity of the inhibitor to be increased. The device uses a spirally twisted strip of corrosion and lime scale inhibiting copper-nickel alloy contained within a cylindrical casing through which the cold water is delivered. The spiral strip churns the water for more complete contact of the water with the strip surfaces as the water flows through the casing. (Sinah-OEIS)
W77-01727

METHOD OF DISINFECTING WATER,
Sachs-Systemtechnik G.m.b.H., Schweinfurt (West Germany).
V. Eibl, and A. Reis.
U.S. Patent No. 3,975,246, 4 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1102, August 17, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, *Disinfection, Water quality control, *Electrolysis, Anodes, Cathodes, Membranes, Electrochemistry, Inorganic compounds, Chemical properties.

Microorganisms in water can be destroyed by electrolysis without impairing the taste of the water and without leaving in the water detectable traces of the chemicals employed during electrolysis. The water to be disinfected is supplied to the anode compartment of an electrolytic cell divided into an anode compartment and a cathode compartment by a membrane permeable to anions and having electrodes in the compartments. The cathode compartment is provided with an aqueous solution of a chloride, hydroxide, carbonate, or peroxide of an alkali metal, with hydrogen chloride, or with hydrogen peroxide in a concentration which exceeds the concentration of the same compound in the treated water. When direct current is passed between the anode and cathode through the cell, the water withdrawn from the anode compartment shows a disinfecting effect greater than would be observed in the absence of the chemicals dissolved in the catholyte, and the chemicals cannot be detected in the withdrawn, treated water by any change in the taste of the water. The anode and cathode compartments may be separated by any membrane permeable to anions, but fastest disinfection has been achieved with a membrane practically impermeable to cations. (Sinha-OEIS)
W77-01734

LIQUID TREATING SYSTEM,
H. H. Wendel.
U.S. Patent No. 3,975,267, 6 p, 3 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1108-1109, August 17, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, *Demineralization, *Ion exchange, *Water quality control, *Resins, Separation techniques, Anion exchange, Cation exchange, Pressure.
Identifiers: Regeneration.

The object of the invention is to provide a purification and demineralizing system for treating water where the quality of the water is maintained for long periods of time and where the expansion of ion exchange resins during regeneration is minimal but which leaves the resins in an expanded or soft bed state. A water purification system can be made much more efficient if the regeneration solutions or liquids and the rinse solutions all contact the ion-exchange resin when under a pressure of at least psi and preferably at least 30 to 60 psi or higher. It is disclosed that exhausted treating material is more efficiently regenerated if the regeneration solution is first used in a dilute solution and the concentration gradually increased until the treating material is substantially and completely regenerated. The regeneration solution is passed through the treating material in a direction opposite to that of the treated water. Any type of anion exchange resin can be utilized however it is preferable if the anion exchange resin is in the hydroxyl form. It is also preferred that a stratified bed be utilized. (Sinha-OEIS)
W77-01739

PROCESS FOR STERILIZING WATER BY THE COMBINATION OF CHLORINE AND ANOTHER HALOGEN,
B. Saunier, and A. Derreumaux.

U.S. Patent No. 3,975,271, 9 p, 6 fig, 4 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1110, August 17, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, *Disinfection, Water quality control, *Chlorination, Halogens, *Bromine, *Iodine, Chlorine.

The process consists essentially in preparing in a reactor a mixture of chlorine and of bromide and/or iodide, in such molar ratios, pH and temperature condition that free bromine and/or free iodine released, and in subsequently feeding the reacted mixture into the water to be treated efficiently sterilizing the water. It makes it possible to deal with possible contamination in the system, and above all, does not deteriorate the organoleptic properties of the water. The bormamines which possibly form have the advantage of having no disagreeable taste or smell and have a disinfecting action much greater than that of the chloramine. The halogen content in the mixture is sufficient to provide for both the oxidation of the nitrogenous matter contained in the effluent and a residual halogen content which enables satisfactory disinfection to be achieved. The disinfection or sterilization processing may be carried out upstream or downstream of any other treatment which might be necessary for other purposes such as filtration, decantation and even prechloration. (Sinha-OEIS)
W77-01742

ION EXCHANGE REGENERATION,
Nalco Chemical Co., Oak Brook, Ill. (Assignee).
K. Odland.
U.S. Patent No. 3,977,968, 7 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 949, No 5, p 2025, August 31, 1976.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, *Water softening, *Ion exchange, Zeolites, Inorganic compounds, Waste water treatment.
Identifiers: Regeneration.

A process for the regeneration of a column of an exhausted sodium zeolite softener comprises feeding an excess of substantially pure soft sodium chloride brine at a concentration of about 8-12% as input regenerating liquid and removing from the zeolite column a hard brine containing substantial amounts of alkaline earth metal values. The total volume of regenerative liquid is adjusted so that the alkaline earth metal values have a maximum value of about 16,000 ppm so as to avoid the formation of a gelatinous product and further precipitation of the alkaline earth metals is by utilizing sodium carbonate and sodium hydroxide, removing the calcium and magnesium precipitates formed and adjusting the pH of the treated liquid to produce a softened brine suitable for recycle as regenerating liquid. (Sinha-OEIS)
W77-01748

DOUBLE-FLOW MAGNETIC FILTER, APPARATUS AND METHOD,
Kraftwerk Union A.G., Muelheim an der Ruhr (West Germany). (Assignee).
H. G. Heitmann, and M. Schott.
U.S. Patent No. 3,979,288, 5 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 950, no 1, p 263, September 7, 1976.

Descriptors: *Patents, *Water treatment, *Water pollution treatment, Water pollution control, Water purification, *Filtration, Powerplants, Electric fields, *Filters.
Identifiers: *Electromagnetic filters, Ferromagnetic impurities.

An electromagnetic filter is comprised of an elongated vertically disposed vessel through which the impure water transverses. A charge of magnetizible ball-like pellets are in the vessel and an electric coil coaxially surrounds the vessel. The coil is electrically energised to produce a magnetic field. Rinsing water is supplied from the lower end of the vessel and discharged from the upper end. Passages having a multiplicity of openings are distributed over the cross-section of the vessel. This electromagnetic filter permits greater flowthrough rates for relatively limited rinsing water demand without allowing nonuniformities or irregularities in the magnetic field and high stray magnetic fields to occur due to a disadvantageous dimension ratio of the coil diameter to the coil height. Such double-flow filters can be installed in steam powerplants heated with fossil fuels or in nuclear powerplants to remove ferromagnetic impurities in feed water. (Sinha-OEIS)
W77-01758

DISEASE RISKS OF OCCUPATIONAL EXPOSURE TO SEWAGE,
Cincinnati Univ., Ohio. Environmental Health Engineering.
For primary bibliographic entry see Field 5C.
W77-01877

WATER POLLUTION CONTROL ACT OF 1972, COSTS AND CAPABILITIES, WATER TREATMENT SYSTEMS,
American Water Works Association Denver, Colo.
For primary bibliographic entry see Field 5D.
W77-01963

HYGIENIC PROBLEMS OF FORECASTING THE QUALITY OF WATER RESOURCES, (IN RUSSIAN),
For primary bibliographic entry see Field 5G.
W77-02071

5G. Water Quality Control

SIGNIFICANCE OF HYGIENIC INVESTIGATIONS IN SOLVING PROBLEMS OF PROTECTING SURFACE WATERS AT THE CURRENT STAGE, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
V. A. Savelova, and R. I. Khalitov.
Gig Sanit 7, p 10-12, 1975.

Descriptors: Public health, Surface waters, Industrial wastes, Water quality control, Runoff, Interbasin transfers, River flow, Diversion, Regulation.

The sanitary state of surface waters, maximum allowable concentrations of common industrial wastewater constituents, water quality control and regulation, diversion and interbasin transfer of river runoff are discussed.
W77-01553

HYGIENIC ASPECTS OF THE CENTRAL WATER HEATING, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
S. N. Cherkinskii, L. N. Gabrilevskaya, and Z. V. Levashova.
Gig Sanit 7, p 7-10, 1975.

Descriptors: *Water supply, *Heated water, Public health, *Water quality standards.
Identifiers: *USSR.

Central hot water supply in the USSR is an important hygienic factor. Open and closed systems are distinguished. Judging by the quality and safety of hot water only the closed systems meet the hygienic requirements.
W77-01559

FORMATION OF WATER QUALITY BY AQUATIC ORGANISMS, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Hydrobiology.
M. M. Boichenko.
Biol Nauki (Mosc) 18(4), p 74-77, 1972.

Descriptors: Water quality, Aquatic animals, Self purification, *Biological treatment, Algae, Organic matter, *Waste water treatment.
Identifiers: *Biological post-treatment, Oscillatoria-spendida.

During self-purification, waters are enriched with metabolitis and restored to biological soundness. Physicochemical regeneration of water should be accompanied by biological aftertreatment. Dissolved organic matter in natural waters was studied to determine the most reactive fraction. lipids and essential fat-soluble vitamins. Enrichment of water with organic and mineral components during its physicochemical regeneration from urine with the aid of an algological polyinoculant containing mainly the blue-green alga Oscillatoria spendida was studied. Addition of the polyinoculant caused the composition of the lipid fraction of dissolved organic matter to become analogous to that in natural waters. The activity of the aquatic organisms gave the regenerated water full biological value. Biological after-treatment is necessary in physicochemical regeneration of water.
W77-01561

EVALUATION OF THE SELF-PURIFYING ABILITY OF WATERS OF THE LOWER DON, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
L. S. Soloveikina.
Izv Sev-Kavk Nauchn Tsentra Vyssh Shk Estestv Nauki, 3(1), p 97-100, 1975.

Descriptors: *Self purification, Temperature, Water pollution, Velocity, Oil wastes, *Oil pollution, *Phenols, Industrial wastes.
Identifiers: *Lower Don River(USSR), Azov Sea.

Self-purification of the waters of the Lower Don River (USSR) was evaluated with respect to the removal of individual nonconservative pollutants (petroleum products, syndets, phenols). The effects of temperature, stream velocity, water discharges and degree of pollution were determined. Self-purification of the Lower Don is insufficient to mineralize the pollutants before they enter the Azov Sea.
W77-01569

DETERMINATION OF ESTIMATED MAXIMUM PERMISSIBLE AND MAXIMUM RESIDUAL CONCENTRATIONS OF PESTICIDES IN ENVIRONMENTAL OBJECTS, BASED ON THE PRINCIPLES OF COMPLEX (INTEGRAL) STANDARDIZATION, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
K. K. Vrochinskii.
Gig Tr Prof Zabol 12, p 31-34, 1974.

Descriptors: *Pesticides residues, *Pollutant identification, *Water quality standards, *Public health, Water pollution control, Air pollution.
Identifiers: *Maximum permissible concentration(Pesticides).

Considering the integrated action of residual pesticides in food products, water and air on humans, the principle of a complex hygienic standardization is applicable. For objects that have no empirically established hygienic standards and also in the case of substances for which maximal permissible concentration (MPC) rates were set experimentally at an earlier date, tentative MPC are estimated. For substances with previously established MPC's it was possible to compare the estimated

and experimental MPC; the standard and experimental values agreed in more than 50% of the cases. The estimated MPC may be used in the practice of sanitary inspection as tentative values and should be further corrected through experimental investigations.--Copyright 1976, Biological Abstracts, Inc.
W77-01575

USE OF PUNCH CARDS FOR ACCUMULATING AND ANALYZING DATA ON THE SANITARY-EPIDEMIOLOGICAL STATE OF RURAL POPULATED AREAS, (IN RUSSIAN),
V. V. Kolodkin, and V. I. Nashivankin.
Gig Sanit 6, p 40-41, 1975.

Descriptors: *Data storage and retrieval, *Rural areas, *Public health, *Epidemiology, Human population, Human diseases.

A punch-card information retrieval system for accumulating and analyzing data on the sanitary and epidemiological state of rural populated areas is described. The card contains 35 descriptions, such as the population size and number of homeowners, preschool institutes and schools, food stores and public eating establishments, livestock farms, public and individual baths, barbershops, sewerage, use of wastes for fertilizing soils, water supply, infectious diseases, etc.
W77-01600

SOME PROBLEMS OF ENVIRONMENTAL PROTECTION IN CONNECTION WITH THE DEVELOPMENT OF NONFERROUS METALLURGY IN THE NORTH CAUCASUS, (IN RUSSIAN),
Rostov-on-Don State Univ. (USSR).
N. G. Zaiva.
Izv Sev-Kavk Nauchn Tsentra Vyssh Shk Estestv Nauki 3(1), p 100-102, 1975.

Descriptors: *Industrial wastes, *Water consumption, *Recycling, *Water conservation, Technology, *Water reuse, Water pollution.
Identifiers: Nonferrous metallurgy plants, *USSR(North Caucasus).

The adverse environmental effects of various waste of nonferrous metallurgy plants in the North Caucasus (USSR) and the possibility of the more rational use of raw materials and wastes to reduce their undesirable environmental effects are discussed. Modern concentration processes based on concentration processes based on considerable water consumption pollute with wastewaters; imperfect technology leads to the loss of valuable components (e.g., Ag, Au, Cu) in wastes. A more effective technology is desirable and will be beneficial to industry and the environment.
W77-01605

SIGNIFICANCE OF SUSPENDED LOAD AND BOTTOM DEPOSITS IN SELF-PURIFICATION OF THE SELENGA RIVER FROM PETROLEUM PRODUCTS, (IN RUSSIAN),
Limnologicheskii Institut, Irkutsk (USSR).
V. Ya. Zyul'Kina.
Gidrobiol Zh 11(3), p 63-65, 1975.

Descriptors: *Self purification, *Oil pollution, Oil wastes, *Chromatography, Fluorescence, *Pollutant identification, *Bottom sediments, Lakes, Industrial wastes, Rivers, Asia.
Identifiers: River Selenga(USSR), Lake Baikal(USSR).

Fluorescence chromatography showed that the petroleum products sorbed by the suspended load of the Selenga River, a major tributary of Lake Baikal, USSR, are composed of a mixture of solar oil and fuel oil. Much of the suspended load is composed of montmorillonite having a high absorption capacity. Entering the river, the petroleum products also pollute the bottom deposits. With distance from the Selenga delta their content in the bottom deposits of Lake Baikal decreases. One gram of suspended solids and bottom deposits sorbs up to 12-25 mg solar oil.
W77-01606

WASTE WATER CONTROL -- DEMONSTRATED FOR A RIVER PROFILE (ABWASSERKONTROLLE -- DEMONSTRIERT AN EINEM FLUSSPROFIL),
Leykam-Muerztaler A. G., Gratkorn (Austria).
For primary bibliographic entry see Field 5B.
W77-01648

ANNUAL BOOK OF ASTM STANDARDS. PART 31: WATER,
For primary bibliographic entry see Field 5A.
W77-01662

A STUDY TO DEFINE CHANGES IN PULP MILL EFFLUENT-CONTRIBUTED COLOR IN RECEIVING WATERS DETECTABLE BY HUMAN OBSERVERS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5A.
W77-01677

1975 REVIEW OF THE LITERATURE ON PULP AND PAPER EFFLUENT MANAGEMENT,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W77-01678

THE INFLUENCE OF TRICKLE IRRIGATION ON THE QUALITY OF IRRIGATION RETURN FLOW,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
K. W. Brown, C. J. Gerard, D. W. DeMichele, P. J. H. Sharpe, and B. W. Hipp.
Texas Water Resources Institute, College Station, Completion Report TR-70, March, 1976. 77 p, 19 tab, 38 fig, 10 ref. OWRT B-156-TEX(1), 14-31-0001-4128.

Descriptors: Water quality, *Leachate, Leaching, Sorghum, *Rio Grande River, *Return flow, *Texas, Nitrates, *Lysimeters, *Salt balances, *Computer models, Simulation analysis, Soil treatment, Crop production, Irrigation water.
Identifiers: *Trickle irrigation, Lower Rio Grande Valley(Tex).

The influence of trickle irrigation on the quality of irrigation return flow was investigated in a field study and by means of computer simulation models. Six undisturbed buried monolith lysimeters were utilized to quantify the leachate from treatment including two different qualities of irrigation water applied through a trickle irrigation system. Both moisture and salt balances were followed inside and outside the lysimeters during a growing season the remainder of the calendar year. A sorghum crop was grown on the lysimeters and in the adjacent area. Irrigation was scheduled based on pan evaporation losses. The irrigation water of high salt content was obtained from a deep well while the irrigation water of low salt content was drawn from the district irrigation canal. The water balance monitored by the neutron probe showed that differences between inside and outside lysimeters were small. The soil contained significant amounts of salt at the beginning of the experiment and trends in the leachate concentration resulting from irrigation treatment are difficult to see after one year of monitoring. Differences between paired lysimeters are large indicating large variability in soil characteristics across the field. Differences in water use inside and outside the lysimeters indicated that during the 1974 growing season, which was dryer than normal, the sorghum crop may have extracted approximately 8% of the water required from the water table. Yield and growth data indicated that the plant root environments inside and outside lysimeters were relatively comparable. Nitrogen, saline water and irrigation treatments did not significantly influence growth and yields of sorghum in 1974.
W77-01680

RESEARCH NEEDS FOR THE LAKE TAHOE BASIN,
Lake Tahoe Area Research Coordination Board, South Lake Tahoe, Calif.
For primary bibliographic entry see Field 6G.
W77-01693

CONNECTICUT RIVER BASIN PROGRAM. PHASE II. WATER QUALITY IMPACT EVALUATIONS ON FLOOD PROTECTION MEASURES FOR THE CONNECTICUT RIVER SUPPLEMENTAL STUDY.
Environmental Protection Agency, Boston, Mass.
Available rom the National Technical Information Service, Springfield, VA 22161 as PB-249 116, Price codes: A05 in paper copy, A01 in microfiche. May 1975. 90 p, 20 tab. CRS-NERBC-EPA 2.1B(4.2).

Descriptors: *Water quality, *Environmental effects, *Flood protection, *Reservoirs, *Dams, *Connecticut River, *Channels, *Dikes, *Nonstructural alternatives, *Land use.
Identifiers: *Connecticut River Basin, Deerfield River, Ashuelot River, Beaver Brook, Sugar River, White River, Ammonoosuc River, Passumpsic River, Moose River, Mill River and Whetstone River.

Water quality evaluations are presented which discuss the possible ramifications of each selected alternative measure for reducing flood damages in the Connecticut River Basin. The evaluations consist of a matrix comparing the impact of each alternative on individual water quality parameters, and a qualified narrative explaining the matrix evaluations. Parameters included dissolved oxygen, sludge deposits, color and turbidity, taste and odor, pH, coliform bacteria, temperature change, chemical constituents, radioactivity and nutrients. Alternatives for the lower basin are: (1) seven upstream reservoirs plus non-structural measures; (2) raising existing dikes and walls, plus non-structural measures; (3) non-structural alternatives. Non-structural alternatives are proposed for the upper basin above the Deerfield River confluence. Effects on water quality are analyzed in the immediate area of the proposed impoundment and downstream from it. Treatment costs for impaired water quality at impoundments are discussed. Land use around impoundments is considered a significant factor in determining water quality. Evaluations of effects on water quality were given for Deerfield River, Ashuelot River, Beaver Brook, Sugar River, White River, Ammonoosuc River, Passumpsic River, Moose River, Mill River and Whetstone River. Significant water quality problems are anticipated at Victory Dam on the Passumpic River from inundated organic areas, at Claremont Dam on the Sugar River from agricultural runoff, and at Honey Hill Dam on the Ashuelot River as developmental pressures increase from the Boston Metropolitan area. (Gentry-North Carolina)
W77-01695

INLAND WATER POLLUTION.
NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 406 Price codes: A04 in paper copy, A01 in microfiche. A Pilot Study. October 1974. 47 p, 2 map.

Descriptors: *Institutions, *Planning, *Comprehensive planning, *Water management(Applied), *Water quality, *Social aspects, *Legal aspects, *International law, *Economics, *Pollution, Canada, United States, Belgium, France.
Identifiers: *North Atlantic Treaty Organization(NATO), Saint John River basin(Canada US). Rhine-Meuse basin.

Agreeing that water quality planning and management require concerted international action to safeguard the economic and social well-being of nations, four member nations of NATO, Canada, United States, France and Belgium, decided to deal with 4 basic areas. First, comprehensive river basin planning and management. The St. John River basin where Canada and the U.S. were involved was examined. Recommendations are: the river basin should be adopted as the geographic unit for water quality planning and management; a comprehensive water quality management plan should include scientific, technical, social, economic, financial and institutional aspects; immediate problems and future needs should be considered; implementation of projects should fit into the developing comprehensive plan; early determination of water quality and quantity standards is essential. Second, indirect instruments in water management. Recommendations are: nations should consider levying charges on effluent discharges and providing financial assistance for pollution abatement, and enlisting public involvement to bring pressure to bear on polluters. Third, mathematical models. Use of models for management decision-making and development of new models is recommended. Fourth, determination of water quality objectives and standards in international water courses. Recommendations are: objectives should be developed jointly by countries involved; international water courses should be given the same priority as national water courses, appropriate institutional arrangements between countries should be created to plan and manage water courses as set forth in objectives. Balance in membership among nations participating in international institutions is desirable. Equal national representation is preferable. (Hufschmidt North Carolina)
W77-01697

REPORT OF RESEARCH AND RESEARCH NEEDS ON WATER QUALITY PROBLEMS IN THE STATE OF HAWAII,
E. F. Eldridge.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 549, Price codes: A06 in paper copy, A01 in microfiche. Prepared for the Department of Health, Education and Welfare, Public Health Service, Washington, D. C., June 1963. 106 p, 14 fig, 7 tab, 144 ref.

Descriptors: *Water quality, *Water treatment, *Waste disposal, *Water pollution, *Saline water intrusion, *Water supply, Research facilities, Water resources development, *Hawaii, Industrial wastes, Estuaries, Bacteria, Viruses, Planning, *Research priorities.
Identifiers: *Ocean waste disposal, *Basal(Subsurface water).

A research program designed to provide the necessary knowledge to meet existing and potential problems of water quality in Hawaii is presented. Existing water quality problems include: (1) contamination of subsurface sources of domestic water supply, especially basal, stemming from salt water intrusion, effluent bacteria and virus, fertilizers, pesticides and herbicides, land disposal of refuse; (2) pollution of nearshore ocean waters caused by ocean disposal of effluent from sewage and waste treatment facilities. Industrial pollution sources are sugar mills, pineapple canneries, and an oil refinery. Recommended research prospectuses and phases of the studies are outlined as follows: (1) Studies of basal water problems- salt water intrusion, ground water movement, fate and travel of bacteria and virus, fate and travel of fertilizers, insecticides and herbicides, reactivity of soils and heavy metals. (2) Ocean disposal of effluents- oceanographic study, effluent-salt water mixing. (3) Water quality versus fish and shellfish-field investigation, bioassay and shellfish contamination. (4) Sewerage- sewage disposal by irrigation, sewage lagoons, combined sewage and industrial wastes, sewerage planning. (5) Industrial waste disposal- cane sugar mills and pineapple cannery wastes. (6) Salt water conversion. (7) Field and laboratory methods- organics, heavy metals and soils. An inventory of research carried out at the University of Hawaii is given. (Gentry-North Carolina)
W77-01698

PROJECT PROPOSAL FOR SURFACE-MINED LAND ENHANCEMENT (SMILE),
Federal Energy Administration, Washington, D.C. Office of Coal.
A. M. Hughes, and D. R. Maneval.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 567, Price codes: A04 in paper copy, A01 in microfiche. January 15, 1975. 65 p, 3 fig, 8 tab.

Descriptors: *Strip mines, *Land reclamation, *Public lands, Employment, *Mine wastes, Pennsylvania, Ohio, Maryland, Kentucky, Alabama, Mine drainage.
Identifiers: *Surface-mined Land Enhancement Project(SMILE), Job opportunities program.

The Federal Energy Administration initiated the proposal for Surface-Mined Land Enhancement (SMILE), with technical assistance from the Appalachian Regional Commission, to be conducted by employees from state goverments who will hire workers, place the contracts and do the engineering work. The project was initiated by the Job Opportunities Program which was established in December 1974 to dispense $125 million for labor intensive programs which would provide employment for those who were jobless during the 1974-1975 recession. Programs and projects chosen were those which could be implemented quickly, were capable of being completed in 12 months and were not inconsistent with locally approved comprehensive plans. The purpose of the program is to reclaim 6,000 acres of the worst strip-mined land on public property in 5 states - Pennsylvania, Ohio, Maryland, Kentucky and Alabama at a cost of less than $4,000 per acre. The total program is estimated to cost $24.8 million and provide 2,726 man-months of employment. Project goals are to restore public lands, demonstrate that strip-mined land can be reclaimed so as to encourage adoption of land restoration techniques, provide immediate employment and practical training, improve secondary employment opportunities and improve national coal production through resource recovery programs. Technical aspects, economic aspects and administrative aspects are outlined. An outside firm will evaluate the program and establish a system for monitoring and measuring project results as the project proceeds. (Gentry-North Carolina)
W77-01699

THE THIRD UNITED NATIONS LAW OF THE SEA CONFERENCE: CARACAS,
Louisiana State Univ. Law Center, Baton Rouge.
For primary bibliographic entry see Field 6E.
W77-01706

REMOVAL OF CHROMIUM, CHROMATE, MOLYBDATE AND ZINC,
Chemical Separations Corp., Oak Ridge, Tenn. (Assignee).
R. C. Chopra.
U.S. Patent No. 3,972,810, 6 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 255, August 3, 1976.

Descriptors: *Patents, *Waste water treatment, Water quality control, *Water purification, Industrial water, Cooling water, Cooling towers, *Metals, *Ion exchange, Separation techniques, Anion exchange, Cation exchange, *Chromium, *Zinc.
Identifiers: *Chromate, *Molybdate.

The continuous evaporation of water circulating through a cooling tower will precipitate increasing concentrations of dissolved solids in the unevaporated water. Eventually as the water is continuously recycled back to the cooling tower, the concentration of dissolved solids will become so high that the water will no longer be able to function as a coolant. It is true that fresh water is added to make up for the water that is evaporated but the make-up water also contains dissolved solids so that gradually the concentration of solids will rise to a level which will prevent the water from serving as an efficient coolant. The solids which are objectionable include trivalent chromium, hexavalent chromate, molybdate and bivalent zinc. Accordingly the water containing these solids is contacted with a mixture of a weak base anion exchange resin and a weak acid cation exchange resin to remove the ions, the mixture is treated with an inorganic acid and a hydroxide to regenerate it so that it can be used in subsequent treatments. (Sinha-OEIS)
W77-01717

FLUIDIC OIL-WATER SEPARATOR,
Office of the Secretary (Navy), Washington, D.C. (Assignee).
A. J. Paszyc, D. Pal, and J. B. Curry.
U.S. Patent No. 3,972,814, 8 p, 7 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 257, August 3, 1976.

Descriptors: *Patents, *Oily water, *Oil pollution, *Water pollution sources, *Water pollution treatment, *Separation techniques, Bubbles, Coalescence, Jets, Oil wastes.
Identifiers: Coanda effect.

The concept of an oil-water separator based on the fluid dynamic phenomenon called the Coanda Effect is utilized. An oil-water mixture jet is split into sub-jets. Each sub-jet enters a bounded region where a separation bubble is formed. Oil is removed from the separation bubble. The oil-water mixture exits the bounded regions into a pair of downstream chambers where the oil coalesces before exiting. A pair of fins are provided to decrease turbulence in the bounded regions and to assist in the retention of oil in the bounded regions. The device comprises a housing having an inlet port, an outlet port and a pair of offsetted walls. The oil-water mixture enters the housing parallel to the offsetted walls. A pair of concavely curved walls having an apex adjacent the inlet port splits the entering oil-water mixture into two sub-jets. (Sinha-OEIS)
W77-01718

OIL EXTRACTOR,
Change, Inc., Tulsa, Okla. (Assignee).
P. Mail, C. R. Ferrin, and R. J. Ely.
U.S. Patent No. 3,972,816. 5 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 257, August 3, 1976.

Descriptors: *Patents, *Oily water, *Oil pollution, *Water pollution sources, *Water pollution treatment, *Separation techniques, Industrial wastes, Coalescence, Emulsions, Dispersion, Equipment, Porous media, Oil wastes.

An oil extractor is described in which a dispersion of oil in water is resolved into two distinct comingled phases by passing the emulsion downward through a bed of properly sized granules and the comingled phases are then conveyed to a phase separator where the phases are dynamically separated and each is discharged separately and

independently of the other. The flow stream is initially directed into an inlet trap for removing relatively large particles and then through a centrifuge for removing substantially all of the entrained solids. The de-emulsifier is comprised of a chamber containing a bulk dense granular material, preferably water wettable. The flow stream is directed downward through the granular material for mechanically breaking the emulsion into two phases and separating the solids. The separator comprises a centrally placed entrance or spreader tube which discharges the flow stream radially outward through a body of granular media contained within a cylindrical housing. The oil and water are separated during passage of the flow stream through the granular media so that the oil percolates upward through a water reservoir for collection in a collector and the water flows downward by gravity for discharge through a suitable valve. (Sinha-OEIS)
W77-01719

CONTAINMENT BOOM,
G. J. Casey.
U.S. Patent No. 3,973,406, 11 p, 13 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 949, No 2, p 481, August 10, 1976.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Barriers, *Water pollution sources, *Water pollution control, Floating, Flexibility, Obstruction to flow, Oil wastes.
Identifiers: Containment.

A collapsible, quickly deployable floating boom barrier is made of an elongated curtain-like partition of strong, flexible, impervious material supported in a vertical position in the water by outrigger-type flotation units. The partition is in the form of an elongated, flexible belt and has sufficient longitudinal flexibility to encircle an oil spill or a ship that might be unloading or loading oil. The outrigger flotation units support the belt at a height above the surface of the water which is approximately 1/3 to 1/2 of the partition width. Each outrigger flotation unit is comprised of a frame and a float. The frame is connected to the side of the partition or belt for pivoting action about a vertical axis extending parallel and immediately adjacent to the side of the belt, and the float is connected to the frame for pivoting action about a horizontally extending axis. This articulation of the frame and float provides a self-stabilizing action of the outrigger flotation units. It also permits each float and frame to be folded back flat against the side of the belt to facilitate deployment of the floating barrier through narrow passageways such as between ships and piers. This articulation also permits the barrier to be folded accordian fashion for compact storage and transport. (Sinha-OEIS)
W77-01721

WATER POLLUTION MONITOR,
Process and Pollution Controls Co., Tulsa, Okla. (Assignee).
For primary bibliographic entry see Field 5A.
W77-01722

WATER CONDITIONING DEVICE,
Marian Co., Chicago, Ill. (Assignee).
For primary bibliographic entry see Field 5F.
W77-01727

WATER GATE,
For primary bibliographic entry see Field 8C.
W77-01729

METHOD AND APPARATUS FOR CONTROLLING THE DISCHARGE OF CONTAMINANTS FROM SHIPS,
I. Bartik.
U.S. Patent No. 3,974,940, 9 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 1005, August 17, 1976.

Descriptors: *Patents, *Water pollution sources, *Waste water disposal, Effluents, *Oil pollution, *Monitoring, Discharge(Water), Water quality control, Water pollution control measurement
Identifiers: Ballast.

A system is provided for monitoring fluid discharged from ships and for determining the amount of contaminants, such as oil, in the fluid. The discharge from the ship is continuously monitored by a meter which will indicate the oil content of the discharge in parts per million. The indicated value may be charted for record purposes. The total volume of discharge from the ship and the speed of the ship may also be measured. The three values obtained by the measurements are processed in computers and a value is obtained for the amount of contaminants being discharged for each unit distance travelled by the ship. When the value reaches a predetermined amount, the discharge from the ship is interrupted, or reduced, so that at no time do the amount of contaminants discharged from the ship exceed a predetermined allowable limit with respect to the speed of travel of the ship. The system is also applicable for controlling the discharge from a ship to limit the concentration of oil in the discharge without regard for the speed of the ship or the total volume of the discharge. (Sinha-OEIS)
W77-01732

CONTAINMENT AND RIDDANCE OF OIL SPILLS,
Office of the Secretary (Navy), Washington, D. C. (Assignee).
D. M. Zall.
U.S. Patent No. 3,977,969, 2 p, 6 ref; Official Gazette of the United States Patent Office, Vol 949, no 5, p 2026, August 31, 1976.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water pollution treatment, *Water pollution control, *Water quality control, *Separation techniques, Polymers, *Coagulation, Skimming.
Identifiers: High molecular weight polymers.

A method for rapidly and efficiently clearing oil spills consists of treating the surface of the oil spill with a polymer of high molecular weight which will coagulate the oil, thus forming a barrier between the oil and the water. Surface oil can then be raked and skimmed off the surface of the water. (Sinha-OEIS)
W77-01749

OIL BOOM AND METHOD OF SKIMMING FLOATING OIL FROM THE SURFACE OF A BODY OF WATER,
National Marine Service, Inc., St. Louis, Mo. (Assignee).
C. Veld.
U.S. Patent No. 3,979,291, 11 p, 10 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 950, no 1, p 264, September 7, 1976.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Barriers, Water pollution treatment, *Water pollution control, Water quality control, *Skimming, Flow control, Equipment, *Separation techniques.
Identifiers: Containment.

An oil boom assembly for collecting lighter liquid from the surface of a body of water includes elongated, parallel rows of vertical, buoyant barrier screen members connected together by flexible means and rigidly braced to hold the rows in parallel relationship in upright position when afloat in water. The rows are of progressively longer length and define open channels for the flow of liquid. A floating liquid diverter at one end of the boom diverts relatively moving liquid into the channels to cause transport currents to flow towards the opposite ends of the channels, where a liquid skimmer is provided to remove surface water and the lighter floating oil. The progressive barrier lengths permit flow of surface water around the ends of the shorter barriers into the channels between the barriers and may be arranged to cause the diverting of flow around the ends of the shorter barriers into the channels and towards the skimmer. (Sinha-OEIS)
W77-01759

A MANUAL OF LAWS, REGULATIONS, AND INSTITUTIONS FOR CONTROL OF GROUND WATER POLLUTION,
National Water Well Association, Worthington, Ohio.
J. H. Lehr, W. A. Pettyjohn, T. W. Bennett, J. R. Hanson, and L. E. Sturtz.
EPA Manual - 440/9-76-006, 1976, 416 p, 37 fig, 6 tab, 150 ref.

Descriptors: *Water pollution control, *Groundwater, Standards, *Institutions, *Water policy, *Regulation, Legislation, Operations, Publications, Administrative agencies, Legal aspects, Manpower, Management, *Water quality standards, Water law, Water pollution sources.
Identifiers: *Pollution control public policy, Legislative intent.

There is no single, simple approach to prevent ground water pollution. Activities that pollute groundwater, and the regulatory techniques necessary for their control, are many and highly varied. This manual describes ground-water resources and sources of pollution, then surveys existing regulations that affect ground-water quality. A number of statutory provisions are proposed that will enable a state to protect groundwater, and presents guidelines for the development of regulations designed to prevent pollution of groundwater. The central feature of the manual are the chapters concerning the regulation of possible contaminating activities. They are guides or starting points, for selection or modification by a state according to its particular needs. The manual is not a proposal to affect water-rights laws. Complete ground-water protection must include controls on the use of water under particular circumstances - reference is made to the propriety of such controls in effecting ground water pollution control. The purpose of the manual is to enchance knowledgeability in the states, and thus to enable establishment of adequate groundwater protection programs on the state or local level. (Heiss-NWWA)
W77-01776

CERTAIN CHARACTERISTIC FEATURES OF FLOWERING AND POLLINATION IN DUCKWEEDS (LEMNACEAE S. GRAY),
For primary bibliographic entry see Field 4A.
W77-01778

ENVIRONMENTAL ASPECTS OF A LARGE TROPICAL RESERVOIR - A CASE STUDY OF VOLTA LAKE, GHANA.
Smithsonian Institution, Washington, D. C. Office of International and Environmental Programs.
For primary bibliographic entry see Field 5C.
W77-01779

WATER POLLUTION INVESTIGATION: ASHTABULA AREA,
Calspan Corp., Buffalo, N. Y.
For primary bibliographic entry see Field 5C.
W77-01780

PROGRAM FOR PREVENTING AND ELIMINATING OIL POLLUTION OF THE BUFFALO RIVER,
Calspan Corp., Buffalo, N. Y.
For primary bibliographic entry see Field 5A.
W77-01782

WATER POLLUTION INVESTIGATION: GENESEE RIVER AND ROCHESTER AREA,
O'Brien and Gere Engineers, Inc., Syracuse, NY.

For primary bibliographic entry see Field 5C.
W77-01785

WATER POLLUTION INVESTIGATION: BUFFALO RIVER,
Versar, Inc., Springfield, Va. General Technologies Div.
For primary bibliographic entry see Field 5C.
W77-01786

ESOO1: VERIFICATION OF MODEL FOR NEW YORK HARBOR,
Environmental Protection Agency, New York. Data Systems Branch.
S. C. Chapra, and S. Gordimer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 848, Price codes: A03 in paper copy, A01 in microfiche. Report No. ESOO1NYV, September 1973. 50 p. 5 fig., 1 tab., 2 ref.

Descriptors: *Computer models, *Estuaries, *Water quality, New York, Sewage effluents, Sewage treatment, Water pollution sources, Biochemical oxygen demand, Oxygen demand.
Identifiers: ESOO1 computer model, New York Harbor, Waste Loads.

A computer model which predicts the steady-state distribution of water quality variables for a one dimensional estuary, ESOO1, was applied to the New York Harbor by using the waste loads and the system parameters for average July-August conditions from 1954 to 1964. The model's applicability as a planning tool is illustrated by the effect of collecting raw waste discharges along the west side of New York City in a single treatment facility. Then, the effect of various treatment levels can be input to the model and the results can be compared with treatment options. However, the underlying assumptions of the model should be considered when applying it to a specific situation, for instance, in some cases the one dimensional approach may be inapplicable, e.g., the effect of high temperatures near a thermal discharge might be significantly minimized by assuming that the estuary is instantaneously mixed vertically and laterally. In other cases, the steady-state, tidally averaged approach would not be sufficient to indicate the time within the tidal cycle which allows the effects of tidal oscillations on water quality to be explicitly depicted. While this model will not supply the total planning horizon to water quality it is an excellent tool for many estuarine situations. Details of the model are presented. (Auen-Wisconsin).
W77-01791

ICE CONDITIONS AND THE PROPOSED CONTAINMENT AND REMOVAL OF SPILLED OIL ON ST. CLAIR AND DETROIT RIVERS,
Canada Centre for Inland Waters, Burlington, (Ontario).
G. Tsang.
Scientific Series No. 56, 1975. 30 p., 12 fig., 2 tab., 10 ref.

Descriptors: *Ice, *Oil spills, *Separation techniques, Rivers, Great Lakes, Water pollution control, Barriers, Design, Mathematical models, Frazil ice, Ice cover, Slush, Canada, Michigan.
Identifiers: *Oil-ice interfaces, Floating booms, Detroit River(Mich), St. Clair River(Ontario), Lake St. Clair(Ontario).

A method is examined for dealing with oil spills on the heavily-trafficked St. Clair and Detroit rivers during iced conditions, especially in the spring breakup when ice floes, slushes and other frozen masses may interfere with spill containment and removal operations. Oil and ice may be separated through use of single or multiple floating booms properly designed and deployed. Dynamic rather than static analysis is suggested for design of the ice and oil booms, and construction of timber is preferred over other materials. Boom designs are provided, along with equations needed for design of booms for specific conditions. Perforated booms may be used to separate oil and drift ice floes, and oil passing through the perforated gap is collectible by a non-perforated second boom. Light oil spilled on fast-flowing water may be contained and separated from the ice by a single non-perforated boom if the device is deployed at a proper angle to the flow. Surface skimming by high-volume pumping is suggested for removal of oil and oil-frazil ice mixtures. Deflecting booms are suggested to keep upstream ice from floating down to interfere with spill sites. Examination is made of the relative probability of various ice conditions for the Detroit River, the St. Clair River and Lake St. Clair. (Harris-Wisconsin)
W77-01802

WATER QUALITY BASELINE ASSESSMENT FOR CLEVELAND AREA--LAKE ERIE. VOL. II - THE FISHES OF THE CLEVELAND METROPOLITAN AREA INCLUDING THE LAKE ERIE SHORELINE,
John Carroll Univ., Cleveland, Ohio. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-01807

DIFFUSE AGRICULTURAL POLLUTION: THE ECONOMIC ANALYSIS OF ALTERNATIVE CONTROLS,
Wisconsin Univ. - Madison. Dept. of Agricultural Economics.
R. R. Schneider, and R. H. Day.
Wisconsin Water Resources Center, Madison, Technical Report WIS WRC, 1976. 98 p, 76-02, 16 fig, 30 tab, 8 maps, 72 ref, 2 append. OWRT A-063-WIS(2). 14-31-0001-5050.

Descriptors: *Agricultural runoff, *Nitrates, *Sediment yield, *Sediments, *Nutrients, Agriculture, *Farm management, Crops, *Fertilizers, *Water pollution sources, *Farm wastes, Legislation, *Wisconsin, Water policy, Water pollution control, Alternative planning.

This study examines policies designed to curtail 3 types of diffuse agricultural pollution: (1). Runoff from winter-spread manures; (2). Sediment in rill and sheet erosion; (3). Nitrate pollution of groundwater resulting from field-applied manure and chemical nitrogen. The following policies are tested on four farm sizes at 4 locations: (1). enforce Wisconsin's Model Sediment Control Ordinance; (2). prohibit all manure spreading in winter; (3). prohibit winter manure spreading on sloped land; (4). prohibit winter manure spreading close to streams, lakes, or open ditches; (5). restrict the excess of applied nitrogen over estimated plant uptake of nitrogen; (6). combine 1, 3, 4 and 5 above; (7). combine 1, 2 and 5 above; (8). restrict average total sediment yield. The effects of these policies on efficiency of resources allocation, and their differential impact in the glaciated and unglaciated regions of the state are explored. The framework for efficiency analysis is that of a partial competitive equilibrium. The estimation of appropriate data for the analysis is an important and integral part of the study. The marginal cost of pollution reduction is calculated for each policy and the marginal cost curve is generated for a sediment policy on selected farms. These data are presented along with the physical quantities of pollutant reduction.
W77-01810

DILUTION FOR EUTROPHICATION CONTROL IN MOSES LAKE: HYDRAULIC MODEL STUDY,
Washington Univ.. Seattle. Dept. of Civil Engineering.
R. E. Nece, J. R. Reed, and E. B. Welch.
Charles W. Harris Hydraulics Laboratory, Technical Report 49, July 1976. 57 p, 21 fig, 1 tab, 15 ref. OWRT A-082-WASH(1), 143-34-10E-3992-3037.

Descriptors: *Eutrophication, Lakes, Sewage effluents, *Waste dilution, *Washington, *Water quality control, Forecasting, *Nutrient removal, Phosphorus, *Hydraulic models, Water transfer.
Identifiers: *Moses Lake(Wash).

Addition of Columbia River water from the Columbia Basin Project irrigation canal system has been proposed in the past as a way of controlling eutrophication in Parker Horn, one of the arms of Moses Lake which is adjacent to the City of Moses Lake, Washington. A vertically distorted physical scale model of the affected regions of Moses Lake was built, and dilution of lake water by the added inflows was measured for two nominal dilution schemes: 500 cubic feet per second of dilution water added for a 20-day pulse, and 1000 cubic feet per second over a 10-day period. Changes in spatial average concentrations of initial lake water were measured in a number of segments of the lake at the ends of the dilution periods, and the temporal decay of lake water concentration following the start of the dilution pulse was measured at a number of discrete sampling stations. Predictions in changes of lake water quality were made on the basis of the model-determined dilutions. Emphasis in these predictions was placed on the effects of changes in phosphorus content. The higher-discharge shorter-duration dilution inflow was the better of the two strategies considered. Effects of sewage effluent removal from Pelican Horn, another arm of the lake also adjacent to the City of Moses Lake, were also considered as well as addition of dilution water to this arm.
W77-01814

EVALUATION OF EFFECTIVENESS OF RESERVOIR DESTRATIFICATION,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
J. E. Garton.
Completion Report, (1976). 24 p, 17 fig, 11 ref. OWRT A-052-OKLA(2). 14-34-0001-6037.

Descriptors: *Destratification, Biochemical oxygen demand, Lakes, *Dissolved oxygen, *Oklahoma, Evaluation, Reservoirs, *Pumps, *Pumping, Water quality control.
Identifiers: *Ham's Lake(Okla), *Lake destratifier(Pump).

A 1-hp prototype lake destratifier was designed, constructed and tested on Ham's Lake. The pump was a six foot ventilating fan supported from an 80 x 80 inch redwood, expanded foam flotation, sandwich. The performance in water, calculated from the performance in air, was 27,000 gallons per minute. Tests showed the power requirement to be within ten percent of the calculated values. The device was placed in operation on June 19, 1975. A 10.1C difference between the top and bottom was reduced to 1.2C difference in four days. The 9 meter water temperature increased 8.5C. The entire body of water continued warming after pumping began and remained between 27 and 29 until the fall turnover in early September. The water had zero dissolved oxygen below 5 meters and in excess of 8 mg/l above 4 meters when pumping started. After four days dissolved oxygen ranged from 7.2 mg/l at the surface to 2.9 mg/l at the bottom. Levels of five day BOD were kept below 2 mg/l after pumping started. Overall water quality in the reservoir was improved. Destratification of the other water quality parameters monitored was observed.
W77-01821

BASELINE CHARACTERIZATION: MARINE MAMMALS,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01826

RESOURCE ASSESSMENT: ABUNDANCE AND SEASONAL DISTRIBUTION OF BOWHEAD AND BELUKHA WHALES - BERING SEA,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01828

ABUNDANCE AND SEASONAL DISTRIBUTION OF BOWHEAD WHALES AND BELUKHA,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div., and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01829

MORBIDITY AND MORTALITY OF MARINE MAMMALS - BERING SEA,
Alaska Univ., College. Inst. of Artic Biology; and Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01830

BIOLOGY OF THE HARBOR SEAL, PHOCA VITULINA RICHARDI, IN THE GULF OF ALASKA,
Alaska Dept. of Fish and Game, Anchorage.
For primary bibliographic entry see Field 6G.
W77-01831

THE NATURAL HISTORY AND ECOLOGY OF THE BEARDED SEAL (ERIGNATHUS BARBATUS) AND THE RINGED SEAL (PHOCA (PUSA) HISPIDA),
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-01832

AN AERIAL CENSUS OF SPOTTED SEALS, PHOCA VITULINA LARGHA,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-01833

TROPHIC RELATIONSHIPS AMONG ICE INHABITING PHOCID SEALS,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-01834

ASSESSMENT OF THE DISTRIBUTION AND ABUNDANCE OF SEA OTTERS ALONG THE KENAI PENINSULA, KAMISHAK BAY AND THE KODIAK ARCHIPELAGO,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-01835

DISTRIBUTION AND ABUNDANCE OF SEA OTTERS IN SOUTHWESTERN BRISTOL BAY,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-01836

POPULATION ASSESSMENT, ECOLOGY AND TROPHIC RELATIONSHIPS OF STELLER SEA LIONS IN THE GULF OF ALASKA,
Alaska Dept. of Fish and Game, Anchorage.
For primary bibliographic entry see Field 6G.
W77-01837

THE RELATIONSHIPS OF MARINE MAMMAL DISTRIBUTIONS, DENSITIES AND ACTIVITIES TO SEA ICE CONDITIONS,
Alaska Dept. of Fish and Game, Fairbanks.
For primary bibliographic entry see Field 6G.
W77-01838

ENVIRONMENTAL ASSESSMENT OF THE BERING SEA: BENTHIC BIOLOGY,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01839

THE DISTRIBUTION, ABUNDANCE, DIVERSITY, AND PRODUCTIVITY OF THE WESTERN BEAUFORT SEA BENTHOS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 6G.
W77-01840

SUMMARIZATION OF EXISTING LITERATURE AND UNPUBLISHED DATA ON THE DISTRIBUTION, ABUNDANCE, AND LIFE HISTORIES OF BENTHIC ORGANISMS,
Oregon State Univ. Corvallis. School of Oceanography.
For primary bibliographic entry see Field 6G.
W77-01841

OUTER CONTINENTAL SHELF ASSESSMENT PROJECT. RAZOR CLAM HABITAT SURVEY - GULF OF ALASKA,
Alaska Dept. of Fish and Game, Kodiak.
For primary bibliographic entry see Field 6G.
W77-01843

A DESCRIPTION AND NUMERICAL ANALYSIS OF THE FACTORS AFFECTING THE PROCESSES OF PRODUCTION IN THE GULF OF ALASKA,
Washington Univ., Seattle.
For primary bibliographic entry see Field 6G.
W77-01844

REVIEW OF LITERATURE AND HISTORICAL DATA ON NON-SALMONID PELAGIC FISHERIES RESOURCES OF THE EASTERN BERING SEA AND GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01845

BASELINE CHARACTERIZATION, LITTORAL BIOTA, GULF OF ALASKA AND BERING SEA,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.
For primary bibliographic entry see Field 6G.
W77-01846

PLANKTON OF THE GULF OF ALASKA - ICHTHYOPLANKTON,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 6G.
W77-01847

INITIAL ZOOPLANKTON INVESTIGATIONS,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 6G.
W77-01848

ZOOPLANKTON AND MICRONEKTON STUDIES IN THE BERING -CHUKCHI/BEAUFORT SEAS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01850

PHYTOPLANKTON STUDIES - BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01851

BASELINE STUDIES OF DEMERSAL RESOURCES OF THE NORTHERN GULF OF ALASKA SHELF AND SLOPE: AN HISTORICAL PREVIEW,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01852

BASELINE STUDIES OF DEMERSAL RESOURCES OF THE EASTERN BERING SEA SHELF AND SLOPE,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 6G.
W77-01853

BEAUFORT SEA ESTUARINE FISHERY STUDY,
Alaska Dept. of Fish and Game, Fairbanks. Sport Fish Div.
For primary bibliographic entry see Field 6G.
W77-01854

SUMMARIZATION OF EXISTING LITERATURE AND UNPUBLISHED DATA ON THE DISTRIBUTION, ABUNDANCE AND PRODUCTIVITY OF BENTHIC ORGANISMS OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 6G.
W77-01856

POLLUTION OF THE RIVER TYNE ESTUARY--THE USE OF MATHEMATICAL MODELS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-01889

AGRICULTURAL WATER POLLUTION: SOME PROBLEMS ASSOCIATED WITH ITS CONTROL,
Kansas Univ., Lawrence. Dept. of Geography.
J. W. Merchant, Jr., and G. A. Marotz.
The Journal of Geography, Vol. 74, No. 7, p 419-429, October, 1975. 1 fig, 1 tab, 22 ref.

Descriptors: *Soil management, *Erosion control, *Agricultural chemicals, *Water pollution sources, *Soil erosion, Water pollution control, Pollution abatement, Surface runoff, Nitrogen compounds, Nutrients, Soil conservation, Great Plains, *Kansas, Chemical wastes.

Nitrogen nutrients from fields and pastures are responsible for a substantial portion of the nation's overall water quality problems and are not as easily controlled as most other sources of pollution. A study was undertaken in Douglas County, Kansas, among land owners who as individuals make soil management decisions to assess their perception of the problem. Results show that (1) the soil erosion problem is seldom viewed correctly and farmers are often unaware of conservation programs or are unwilling to participate; (2) farmers use erosion control to protect their own land; (3) treatment is often undertaken without assistance from the U.S. Soil Conservation Service, or if done with their aid, done so reluctantly; (4) many consider the soil erosion problem to be largely overcome; (5) a majority believe that farms are pollutant sources but the situation is exaggerated in comparison with that of the cities, and; (6) false or inaccurate ideas on self-purification of water, the conservation movement, movement of chemicals in the soil, and operations of the Soil

Conservation Service are prevalent. Although the study was conducted among a small group of farmers, the authors believe that it is representative of many other watersheds of the central Great Plains. They suggest increased publicity concerning the pollution and the fragility and complexity of the ecosystem. (Jamail-Arizona)
W77-01898

CHARACTERIZATION OF URBAN RUNOFF - NEW JERSEY,
Rutgers - The State Univ., New Brunswick N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W77-01945

MATHEMATICAL MODELING FOR WATER QUALITY MANAGEMENT IN STREAMS UNDER UNSTEADY HYDRAULIC CONDITIONS,
Tennessee Univ., Knoxville. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-01946

SOUTHEASTERN FORESTS AND THE PROBLEM OF NON-POINT SOURCES OF WATER POLLUTION,
Forest Service (USDA), Franklin, N. C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 5B.
W77-01952

WATER QUALITY ANALYSIS, UPPER MISSISSIPPI RIVER BASIN.
Water Resources Engineers, Inc., Walnut Creek, Calif.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 982, Price codes: A06 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/64, July 1975, 106 p. WQ5AC025.

Descriptors: Sites, *Mississippi River Basin, *Minnesota, *River basins, Ecology, Federal Water Pollution Control Act, Environments, Limnology, *Water pollution control, Pollution abatement, Water quality, Forecasting, Water treatment.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Upper Mississippi River Basin(Minn).

A comprehensive water quality analysis at the Upper Mississippi River Basin was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality conditions and (2) projected resultant water quality within the site, assuming specific levels of wastewater treatment to point source effluents entering the study site. This assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01953

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, GRAIN MILLING.
Development Planning and Research Associates, Inc., Manhattan, Kans.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 223, Price codes: A10 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/76, November 1975, 184 p. WQ5AC011.

Descriptors: *Grains(Food), *Economic impact, Economics, Forecasting, Federal Water Pollution Control Act, Water pollution control, *Industries, Capital costs, Pollution abatement, Engineering costs, Mills.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Grain milling.

The economic impacts on selected segments of the grain milling industry (ready to eat cereals, rice mills using parboiling processes and the corn wet mills of the wheat starch portion of the wet corn industry) to achieve the 1977 (BPT) and 1983 (BAT) limitation requirements of the Federal Water Pollution Control Act Amendments of 1972 were assessed. Since most of these plants discharge into municipal systems and are exempt from both BPT and BAT requirements, there are only 7 such plants subject to controls. Total capital investment (in 1973 dollars) will be an estimated $28,252 for BPT and $7,114 for BAT. Most significant impacts will fall on the wet corn milling segment where prices will increase an estimated 0.7% over baseline for 1977 controls with a total of 0.8% over baseline for BAT. The only closure expected to result from BPT and BAT will be in the wheat starch category, due to already marginal profits. (NCWQ)
W77-01954

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, COLUMBIA RIVER.
Parametrix, Inc., Seattle, Wash.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 324, Price codes: A10 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/72, December 1975, 195 p. WQ5ACO36.

Descriptors: Rivers, *Columbia River, *River basins, Ecology, *Environmental effects, Environment, Limnology, Federal Water Pollution Control Act, Water pollution control, Pollution abatement, Forecasting, Water quality, Water treatment, Sites.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

A comprehensive environmental impact assessment at the Columbia River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing environmental conditions and (2) projected anticipated biological, ecological and environmental change, impacts and benefits, assuming specific reductions in point source effluent loadings and resultant water quality within the site. This site assessment was one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01955

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, UPPER RIO GRANDE,
Academy of Natural Sciences of Philadelphia, Pa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 228, Price codes: A07 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/67, June 1975, 163 p. WQ5AC044.

Descriptors: Rivers, *New Mexico, *Rio Grande River, Ecology, Federal Water Pollution Control Act, Environments, *Environmental effects, Limnology, Water pollution control, Colorado, Texas, Pollution abatement, Forecasting, *Water quality, Water treatment, Sites.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Upper Rio Grande River(N Mex).

A comprehensive environmental impact assessment at the Upper Rio Grande was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing environmental conditions and (2) projected anticipated biological, ecological and environmental change, impacts and benefits, assuming specific reductions in point source effluent loadings and resultant water quality within the site. This site assessment was one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01956

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, HOUSATONIC RIVER,
Lawler, Matusky and Skelly Engineers, Tappan, N. Y.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 926, Price codes: A18 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/57, December 1975, 390 p. WQ5AC034.

Descriptors: Rivers, Federal Water Pollution Control Act, Ecology, *Environmental effects, Environment, *Massachusetts, Limnology, Water pollution control, Forecasting, *Water qualty, Water treatment, Pollution abatement, Sites.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Housatonic River(Mass).

A comprehensive water quality analysis and environmental impact assessment at the Housatonic River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01957

STRATEGIC ENVIRONMENTAL ASSESSMENT SYSTEM, RESIDUALS FORECASTING, AN ANALYSIS OF RESULTS,
International Research and Technology Corp., Washington, D. C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 041, Price codes: A04 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/106, February 1976, 64 p. WQ5AC018.

Descriptors: *Forecasting, *Industrial wastes, Environmental effects, Federal Water Pollution Control Act, Cost analysis, Waste disposal, Economic impact, *Estimates, *Water pollution control, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

The Strategic Environmental Assessment System (SEAS), developed by the Environmental Protection Agency was used to assess the impacts of the recommended control strategies of the Federal

Water Pollution Control Act Amendments of 1972 (P.L. 921500) on the generation and the discharge of industrial residuals. A set of water residual coefficients and economic growth projections for 350 significant industrial point source categories were entered into SEAS. Considered was the extent to which the disaggregation of sectors and the incorporation of technological information has improved the ability of SEAS to forecast residual discharge levels, along with its implications for national environmental policy. Also considered is the predictive value of the model. Improvements needed to make SEAS a more fully analytical tool are discussed. (NCWQ)
W77-01958

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, PILOT STUDY, FIVE INDUSTRIES,
Conference Board, Inc., New York.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 628, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/73, June 1975, 745 p. WQ4AC007.

Descriptors: Alkalies, *Economic impact, Chlorides, Forecasting, Blast furnaces, Engineering costs, Steel plants, Water pollution control, Pulp mills, Pollution abatement, Paperboards, Federal Water Pollution Control Act, Paper mills, Chemical industry.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

An analysis was made of historical patterns of water pollution and treatment per unit of physical output in five industries -- blast furnaces and steel mills (SIC 3312), petroleum refining (SIC 2911), industrial organic chemicals (SIC 2818), pulpmills, papermills, paperboard mills (SIC 2611, 2621, 2631), and alkalies and chlorine (SIC 2812) -- in light of changes in technology, production processes, output mix and input mix. Impacts are measured by estimated deviation from baseline, i.e., projected water pollution abatement in the absence of the 1972 Federal Water Pollution Control Act Amendments. An analysis of how the industries will meet the 1977(BPT), 1983(BAT) and 1985(EOD) goals and requirements of the Act is given along with estimates of associated costs. Included are estimated investment and operating expenditures for the five industries necessary to meet the law's requirements. (NCWQ)
W77-01959

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, CHEMICAL AND ALLIED INDUSTRIES,
International Research and Technology Corp., Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 289, Price codes: A20 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/97, March 1976, 470 p. WQ5AC015.

Descriptors: *Chemicals industry, *Cost analysis, Federal Water Pollution Control Act, Construction costs, *Economic impact, Forecasting, Operating costs, Pollution abatement, Engineering costs.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

An examination was made of the economic impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on the chemical and allied industries. Growth estimates for 1972-1983 for 374 chemicals are presented along with estimated capital requirements, operating and maintenance and annualized costs for three levels of abatement -- best practicable treatment technology, best available technology and elimination of the discharge of pollutants. Included are aggregated chemial-specific costs to arrive at total firm and industry abatement costs and evaluations of alternative pricing responses to increased production costs. (NCWQ)
W77-01960

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, ESCAMBIA RIVER AND BAY,
Atlantis Scientific, Tallahassee, Fla.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 447, Price codes: A12 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/80, March 1976, 269 p. WQ5AC037.

Descriptors: *Bays, *Florida, *Environmetal effects, *Rivers, Federal Water Pollution Control Act, Ecology, Environments, Limnology, Water pollution control, Forecasting, Water quality, Water treatment, Sites.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Escambia River-Bay(Fla).

A comprehensive water quality analysis and environmental impact assessment at the Escambia River and Bay was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01961

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, GUADALUPE-SAN ANTONIO RIVER BASIN,
Water Resource Engineers, Inc., Austin, Tex.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 430, Price codes: A14 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/92, March 1976, 314 p. WQ5AC025.

Descriptors: Rivers, *Texas, River basins, *Environmental effects, Sites, Federal Water Pollution Control Act, Ecology, Limnology, Water pollution control, Water quality, Forecasting, Water treatment, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Guadalupe-San Antonio River Basin(Tex).

A comprehensive water quality analysis and environmental impact assessment was undertaken at the Guadalupe-San Antonio River Basin as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01962

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, ST. JOHN RIVER ESTUARY (FLORIDA),
Atlantis Scientific, Tallahassee, Fla.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 225. Price codes: A12 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/81, March 1976, 272 p. WQ5AC037.

Descriptors: *Rivers, *Florida, *Environmental effects, Ecology, River basins, Limnology, Federal Water Pollution Control Act, Water pollution control, Water quality, Forecasting, Water treatment, Sites.
Identifiers: Federal Water Pollution Control Act Amendments of 1972, *St. John River(Fla).

A comprehensive water quality analysis and environmental impact assessment at the St. John River (Florida) was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01964

NOVEMBER 1975 STAFF DRAFT REPORT: REVIEW AND COMMENT,
National Research Council, Washington, D. C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 040. Price codes: A04 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/102, January 1976, 75 p. WQ4AC002.

Descriptors: Water pollution control, Pollution abatement, Water law, Federal Water Pollution Control Act, Water quality.
Identifiers: *National Commission on Water Quality, *Federal Water Pollution Control Act Amendments of 1972.

Review and comments are presented on major findings and supporting materials in the Staff Draft Report of the National Commission on Water Quality, published in November, 1975. (NCWQ)
W77-01965

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, GULF OF ALASKA.
Tetra Tech, Inc., Pasadena, Calif.
Available from National Technical Information Service, Springfield, VA 22161 as PB-251 322, Price codes:A12 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/84, March 1976, 255 p. WQ5ACO27.

Descriptors: Sites, *Alaska, *Environmental effects, *Gulfs, Federal Water Pollution Control Act, Ecology, Limnology, Water pollution control, Forecasting, Water quality, Water treatment.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Gulf of Alaska.

A comprehensive water quality analysis and environmental impact assessment was undertaken at the Gulf of Alaska as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements

and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01966

CAPITAL MARKETS AND WATER QUALITY NEEDS: 1975-1985.
Conference Board, Inc., New York.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 042, Price codes: A05 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. 20036. Report NCWQ 75/101, June 1975, 88 p. WQ4AC007-2.

Descriptors: Economics, *Government finance, Forecasting, Federal Water Pollution Control Act, Water pollution control, *Economic impact, Pollution abatement, Financing, Capital, Cost analysis, Investment, Water quality.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Remarks and comments presented in June, 1975 at a conference -- Capital Markets and Water Quality Needs: 1975-1985 -- sponsored by the Conference Board are presented. Statements on various aspects of the financial impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) are given along with summary analyses and conclusions. (NCWQ)
W77-01967

WATER QUALITY ANALYSIS, THE POTOMAC RIVER.
GKY and Associates, Alexandria, Va.
Available from National Technical Information Service, Springfield, VA 22161 as PB-252 038, Price codes: A06 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/91, January 1975, 110 p. WQ5AC060.

Descriptors: Sites, *Potomac River, *Environmental effects, Rivers, Federal Water Pollution Control Act, River basins, Ecology, Water pollution control, Pollution abatement, *Water quality, Forecasting, Water treatment.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

A comprehensive water quality analysis at the Potomac River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality conditions and (2) projected resulting water quality within the site, assuming specific levels of wastewater treatment to point source effluents entering the study site. This assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01968

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, S. CALIFORNIA BIGHT.
Tetra Tech, Inc., Pasadena, California.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 435, Price codes: A20 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/93, April 1976, 468 p. WQ5AC027.

Descriptors: Bays, *California, *Environmental effects, Sites, Federal Water Pollution Control Act, Ecology, Limnology, Water pollution control, *Water quality, Forecasting, Water treatment, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Southern California Bight.

A comprehensive water quality analysis and environmental impact assessment was undertaken in the S. California Bight as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01969

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, HAWAII.
Tetra Tech, Inc., Pasadena, Calif.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 320, Price codes: A12 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/83, March 1976, 253 p. WQ5AC027.

Descriptors: Sites, *Hawaii, *Environmental effects, Ecology, Federal Water Pollution Control Act, Limnology, Water pollution control, Forecasting, *Water quality, Water treatment, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

A comprehensive water quality analysis and environmental impact assessment was undertaken in Hawaii as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01970

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, PUERTO RICO.
Tetra Tech, Inc., Pasadena, Calif.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 323, Price codes: A11 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/82, March 1976, 250 p. WQ5AC027.

Descriptors: Sites, *Puerto Rico, *Environmental effects, Ecology, Federal Water Pollution Control Act, Limnology, Water pollution control, *Water quality, Forecasting, Water treatment, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

A comprehensive water quality analysis and environmental impact assessment was undertaken in Puerto Rico as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01971

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, SOUTH PLATTE.
Tetra-Tech, Inc., Pasadena, Calif.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 446, Price codes: A20 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/78, December 1975, 453 p. WQ5AC027.

Descriptors: Rivers, Federal Water Pollution Control Act, Ecology, *Environmental effects, Environment, *Colorado, *Nebraska, Limnology, Water pollution control, Pollution abatement, Forecasting, *Water quality, Water treatment, Sites.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *South Platte River(Colo-Neb).

A comprehensive water quality analysis and environmental impact assessment at the South Platte River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01972

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, SUSQUEHANNA RIVER.
Lawler, Matusky and Skelly Engineers, Tappan, N. Y.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 925, Price codes: A14 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/56, December 1975, (186 p). WQ5AC034.

Descriptors: *Rivers, *Environmental effects, Ecology, Federal Water Pollution Control Act, Environment, *New York, Limnology, Water pollution control, Forecasting, *Water quality, Water treatment, Sites, Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Susquehanna River(NY).

A comprehensive water quality analysis and environmental impact assessment at the Susquehanna River was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the

requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01973

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, DIGEST OF LEGAL ISSUES.
Bureau of National Affairs, Inc., Washington, D.C. Environment and Safety Research Service.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 975, Price codes: A20 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/66, September 1975, 469 p. WQ5AC097.

Descriptors: *Water law, Public rights, *Legal aspects, Federal Water Pollution Control Act, Water rights, *Institutions, *Institutional constraints, *Water pollution control, Regulations.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

A summary analysis of significant legal issues raised by the litigation of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) is presented. Issues examined include jurisdiction, effluent limitations guidelines, regulations, special problems raised by the steam electric power industry, new source performance standards, National Pollution Discharge Elimination System permits, Environmental Protection Agency's general counsel's decisions, Section 208 management planning and impoundment. Issues are identified and major arguments presented by the litigants are described. (NCWQ)
W77-01974

WATER POLLUTION CONTROL LAW OF 1972, REGIONAL IMPACTS, KANAWHA RIVER.
Dames and Moore, Cincinnati, Ohio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 105, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/30, November 1975, 877 p. WQ5AC055.

Descriptors: *River basins, *Regional analysis, *West Virginia, Regions, Federal Water Pollution Control Act, Water pollution control, Pollution abatement, Water quality, Water law, Economic impact, Forecasting.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Kanawha River(W Va).

The environmental, social, economic, and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on the Kanawha River are reviewed. The study concentrates on the impacts to be experienced in the Charleston, West Virginia area. Water quality changes, as a result of the Act's 1977 (best practicable treatment technology), 1983 (best available technology) and 1985 (elimination of the discharge of pollutants) requirements and goals are presented. Estimated costs (in 1973 dollars) to meet the goals of the Act are given along with the technology necessary to meet required abatement levels. Recreational, social and economic effects of the Act are considered. Existing and future institutional arrangements necessary to implement the law are examined. (NCWQ)
W77-01975

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, SANTEE RIVER BASIN.
Academy of Natural Sciences of Philadelphia, Pa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 354, Price codes: A13 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. 20036. Report NCWQ 75/71, July 1975, 260 p. WQ5AC044.

Descriptors: Rivers, Federal Water Pollution Control Act, Ecology, *Environmental effects, Environment, *River basins, Limnology, *South Carolina, *North Carolina, *Water pollution control, Pollution abatement, Forecasting, Water quality, Water treatment, Sites.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Santee River Basin(SC-NC).

A comprehensive environmental impact assessment at the Santee River Basin was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements and goals of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The assessment (1) characterized historical and existing environmental conditions and (2) projected biological, ecological and environmental change, impacts and benefits, assuming specific reductions in point source effluent loadings and resultant water quality within the site. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01976

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, ST. JOHN RIVER (MAINE).
Meta Systems, Inc., Cambridge, Mass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 942, Price codes: A16 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/58, December 1975, 335 p. WQ5AC047.

Descriptors: Rivers, *Maine, *Environmental effects, Ecology, Federal Water Pollution Control Act, Environments, Canada, Limnology, Water pollution control, Forecasting, *Water quality, Water treatment, Pollution abatement, Sites.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *St. John River(Maine), New Brunswick.

A comprehensive water quality analysis and environmental impact assessment at the St. John River (Maine) was undertaken as part of a national assessment of anticipated environmental impacts of theoretically achieving or not achieving the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). The analysis (1) characterized historical and existing water quality and environmental conditions, (2) projected resultant water quality, assuming specific levels of wastewater treatment to point source effluents entering the study site, and (3) anticipated biological, ecological and environmental effects, impacts and benefits to result from projected changes in water quality. This site assessment is one of 41 similar studies conducted for the Environmental Sciences sector of the National Commission on Water Quality. (NCWQ)
W77-01977

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, DELAWARE RIVER BASIN, (PARTS 1, 2, AND 3).
Betz Environmental Engineers, Inc., Plymouth Meeting, Pa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 910, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/28, September 1975. 1,354 p. WQ5AC048..

Descriptors: *River basins, *Regional analysis, Regions, Federal Water Pollution Control Act, Water pollution control, *Delaware River, Pollution abatement, Environmental effects, Water law, Social aspects, Economic impact, Forecasting.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Delaware River Basin.

The environmental, social, economic, and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) on the lower half of the Delaware River Basin are reviewed. Among the environmental impacts to be experienced are reduced bacteriological concentrations and the recovery of certain fish populations. Water oriented recreation will increase approximately 170% in response to projected water quality improvement. Institutional arrangements are limited by such factors as an inadequate regional data processing system, manpower shortages and a lack of Federal funds. Capital costs to meet the 1977 and 1983 effluent requirements of the law, annualized over a 20-year period at 7% interest, will be $12.5 million/yr (1973 dollars). With the addition of O and M costs, this figure jumps to an annual cost of $39 million during 1977 and $48 million during 1983. The 1977 requirement of the Act will not be met until 1980 in the basin. (NCWQ)
W77-01978

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, GREAT LAKES-LAKE ERIE, (VOLUMES 1, 2, AND 3).
Dalton-Dalton-Little-Newport, Inc., Cleveland, Ohio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 009, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D. C. Report NCWQ 75/49, December 1975. 1,081 p.

Descriptors: Lakes, *Regional analysis, *Lake Erie, Regions, Federal Water Pollution Control Act, Water pollution control, Great Lakes, Pollution abatement, Environmental effects, Water law, Social aspects, Economic impact, Social change.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

The environmental, social and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on the Lake Erie region are reviewed. Water quality changes as a result of the Act's 1977 (best practicable treatment technology), 1983 (best available technology) and 1985 (elimination of the discharge of pollutants) standards and goals are presented. Estimated costs in 1973 dollars to meet the goals of the Act are given along with the technology necessary to meet required abatement levels. Recreational, social and economic effects of the Act are considered. Existing and future institutional arrangements necessary to implement the law are examined. (NCWQ)
W77-01979

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, CHATTAHOOCHEE-FLINT-APALACHICOLA, (PARTS 1 AND 2).
Hammer, Siler, George Associates, Atlanta, Ga.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 318, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/108, March 1976. 1,092 p. WQ5AC057.

Descriptors: *River basins, *Regional analysis, Regions, Federal Water Pollution Control Act, Water pollution control, *Georgia, Pollution abatement, Environmental effects, Water law, Social aspects, Economic impact, Forecasting.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Chattahoochee-Flint-Apalachicola(Geo).

The environmental, social and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on the Chattahoochie-Flint-Apalachicola River system are reviewed. Water quality changes, as a result of the Act's 1977 (best practicable treatment technology), 1983 (best available technology) and 1985 (elimination of the discharge of pollutants) standards and goals are presented. Estimated costs (in 1973 dollars) to meet the goals of the Act are given along with the technology necessary to meet required abatement levels. Recreational, social and economic effects of the Act are considered. Existing and future institutional arrangements necessary to implement the law are examined. (NCWQ)
W77-01980

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, OHIO RIVER BASIN, (VOLUMES 1 AND 2).
Dames and Moore, Cincinnati, Ohio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 680, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/26, November 1975. 1,693 p.

Descriptors: *River basins, *Regional analysis, Regions, Federal Water Pollution Control Act, Water pollution control, *Ohio River, Pollution abatement, Environmental effects, Water law, Social aspects, Economic impact, Forecasting.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Ohio River Basin.

The environmental, social and institutional impacts of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) on the Ohio River Basin are reviewed. The study area covers Cincinnati and the Huntington-Ashland-Portsmouth region. Water quality changes, as a result of the Act's 1977 (best practicable treatment technology), 1983 (best available technology) and 1985 (elimination of the discharge of pollutants) standards and goals are presented. Estimated costs (in 1973 dollars) to meet the goals of the Act are given along with the technology necessary to meet required abatement levels. Recreational, social and economic effects of the Act are considered. Existing and future institutional arrangements necessary to implement the law are examined. (NCWQ)
W77-01981

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, PUBLICLY OWNED TREATMENT WORKS, (VOLUMES 1, 2 AND 3).
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W77-01982

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, STEAM ELECTRIC POWER INDUSTRY, (VOLUME 1, 2 AND 3).
Taknekron, Inc., Berkeley, Calif.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 372, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/86, March 1976. 1,164 p.

Descriptors: Economics, *Industrial wastes, Engineering costs, Waste disposal, *Estimated costs, *Water pollution control, Forecasting, Water quality, Federal Water Pollution Control Act, Industrial water, *Electric power industry, Pollution abatement, Electric power production, *Cost analysis, *Water quality standards.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Steam electric power industry.

Details are presented of the capabilities of water pollution abatement technologies and associated capital, operating and maintenance costs necessary for the industry to meet the thermal and chemical effluent discharge requirements of the 1972 Water Pollution Control Act Amendments. Results suggest that some of the effluent limitations for chemical discharges are inconsistent and will produce little significant reduction of effluents. Some effluent limitations may actually increase the effluent quantities of specific pollutants. Estimates of capital costs range from $4.45 to $9.04 billion (1973 dollars). Real total operating costs are projected to increase by 3%-5%. An econometric model is used to estimate changes in prices, demand, return on equity, and additional financial parameters due to water pollution control expenditures. Real electricity prices will increase an estimated .5%-1% as a result of the requirements of the Act. Included are estimates of the number of steam electric power units likely to receive exemptions to the requirements of the Act. (NCWQ)
W77-01983

BENEFITS FROM WATER POLLUTION ABATEMENT, BEACH CLOSINGS AND REOPENINGS.
Battelle Memorial Inst., Columbus, Ohio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 221, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/77, February, 1975. 673 p. WQ5AC013.

Descriptors: *Beaches, *Benefits, *Swimming, Coasts, Great Lakes region, *Recreation, Forecasting, Federal Water Pollution Control Act, Water Quality, Economics, *Pollution abatement, Water pollution control.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Based on a survey of 3,521 public health agencies in all coastal and Great Lakes states and in a sample of ten inland states, 449 public and private beaches have had water quality problems of varying degrees. Projected water quality improvements as a result of the 1972 Water Pollution Control Act Amendments will increase total useable capacity by an estimated 1.2%-2.7%. Results showed that a maximum of 86% of presently affected beaches may be improved by the Act. Gains in recreational swimming will be primarily concentrated in urban areas. Improved water quality is expected to produce savings in time and travel cost for individuals diverting to closer beaches. Improvement in useable capacity will produce a net gain in total outdoor swimming activity as a result of increased accessability to useable swimming areas. (NCWQ)
W77-01985

BENEFITS FROM WATER POLLUTION ABATEMENT, COASTAL WATERS, (VOLUMES 1 AND 2).
Florida State Univ., Tallahassee. Dept. of Economics.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 172, Price codes: A99 in paper copy, A01 in microfiche. National Commission on Water Quality, Washington, D.C. Report NCWQ 75/88, April 1976. 617 p. WQ5AC008.

Descriptors: *Coasts, *Benefits, *Oceans, Federal Water Pollution Control Act, Marine fish, *Recreation, Fishing, Economics, Forecasting. Water pollution control, *Pollution abatement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972.

Estimates are made of the incremental benefits which will accrue to commercially harvested marine (coastal and ocean) species and related recreational use of marine species with respect to marine harvestibility, biological productivity and opportunities for mariculture, as a result of the requirements of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). If the law is properly implemented, most shellfish areas will be opened by 1980-1985. While the exact response of changes in marine productivity due to projected water quality improvement is not known, it is estimated that catches would increase at a declining rate. Because these water quality improvements will probably influence both mariculture and wild stock equally, no net or differential benefits accrue to mariculture. It is anticipated that improved water quality will increase recreational days fished. Included are regional price and employment impacts estimated to result from the projected increase in commercial catch and recreational fishing days. (NCWQ)
W77-01986

STUDIES ON THE OXIDATION OF ORGANIC SULPHIDES IN KRAFT BLACK LIQUOR,
British Columbia Univ., Vancouver.
F. E. Murray, and C. B. Prakash.
Pulp and Paper Canada, Vol. 77, No. 8, p 47, 49-52, August, 1976. 11 fig, 11 ref.

Descriptors: *Pulp wastes, Pulp and paper industry, *Odor, *Oxidation, *Sulfides, *Air pollution, Chemical reactions, Kinetics, Pressure, Temperature, Organic compounds, *Pollution abatement.
Identifiers: Dimethyl sulfide, Dimethyl disulfide.

The oxidation of dimethyl sulfide and dimethyl disulfide in kraft black liquor at temperatures of 120-180C and oxygen partial pressures of 1-6 atmospheres was studied in an attempt to assess the effectiveness of this reaction in controlling odors from these compounds. At a partial pressure of 2 atmospheres, the oxidation rates of both compounds increased with temperature and reached a maximum at 160C. As the temperature increased beyond 160C, actual to theoretical oxygen ratio rapidly increased, suggesting that reactions other than the oxidation of organic sulfides were beginning to compete for oxygen usage. Changes in partial pressure at 160C had no effect on oxidation rate; however, at 120C oxidation rate increased with partial pressure increases. Oxygen consumption measurements revealed that a process to oxidize nearly all of the sulfides in black liquor would consume twice the stoichiometric amount of oxygen consumed by sulfur oxidation. In order to reduce the concentration of organic sulfides in black liquor by 90%, an estimated 2 hr would be required for their oxidation in a batch or plug flow reactor; this does not appear to be fast enough for commercial application. (Kreager-FIRL)
W77-02001

WATER HYACINTHS AND ALLIGATOR WEEDS FOR REMOVAL OF SILVER, COBALT, AND STRONTIUM FROM POLLUTED WATERS,
National Space Technology Labs., Bay St. Louis, Miss.
B. C. Wolverton, and R. C. McDonald.
Report No. NASA TM-X-72727, May 1975. 13 p. 16 fig., 4 tab., 3 ref.

Descriptors: *Aquatic plants, *Water pollution treatment, *Heavy metals, Silver, Cobalt, Strontium, Water hyacinth, Alligatorweed, Absorption, Water purification, Mississippi.

Experimentally determined data demonstrate the ability of alligator weeds and water hyacinths to rapidly absorb silver, cobalt, and strontium from waters. Water hyacinths are capable of removing a maximum of 0.439 mg of silver, 0.568 mg of cobalt, and 0.544 mg of strontium in an ionized form from static waters per gram of dry plant weight in a 24-hr period. The growth rate of water hyacinths is approximately 600 kg of dry plant material per hectare (2.47 acres) per day. Therefore, water hyacinths could potentially remove 263.4 g (0.581 lb) of silver, 340.8 g (0.752 lb) of cobalt, and 326.4 g (0.721 lb) of strontium per hectare (2.47 acres) per day provided the metal saturated plants are harvested at regular intervals. Alligator weeds were able to remove a maximum of 0.439 mg of silver, 0.130 mg of cobalt, and 0.161 mg of strontium from lentic waters per gram of dry plant weight per day. (Auen-Wisconsin)
W77-02037

EFFECTS OF POLLUTION ON HUMAN HEALTH,
Environmental Protection Agency, Chapel Hill, N.C. Clinical Studies Branch.
For primary bibliographic entry see Field 6G.
W77-02045

INTRODUCTORY REMARKS ON ENVIRONMENTAL CONTROL STRATEGIES,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 6G.
W77-02048

AGRICULTURAL AND OTHER NON-POINT SOURCES OF WATER POLLUTION,
Interstate Commission on the Potomac River Basin, Bethesda, Md.
Y. Gordon.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 231-241 and 313-330.

Descriptors: *Planning, *Water pollution sources, *Water pollution control, *Regulation, *Standards, Sediment discharge, Legislation, Forest management, Construction, Mining, Urban runoff, Storm drains, Landfills, Return flow, Agricultural runoff, Economic efficiency, Nuclear powerplants, Acid mine drainage.
Identifiers: *Non-point pollution sources.

This panel's generalized discussion considered non-point pollution sources caused by mining, agriculture, silviculture, urban storm runoff, pesticides, construction activities, stream modifications (which may generate downstream erosion and sediment deposition), groundwater contamination by land sludge disposal with the potential for groundwater contamination and uptake by food crops, the lesser impact of nuclear power plants as compared to fossil plants, runoff from uranium mines, and storage of nuclear wastes. The EPA's immediate strategy for reducing non-point pollution stresses prevention by proper management of pollution-causing activities with emphasis on identification, assessment, monitoring, and prediction of the effects on ambient water quality, and investigations of institutional measures which may include the use of 'activity permits.' EPA's long-term strategy involves development, testing, and demonstration of new technological/engineering means of controlling non-point pollution sources; and planning, management, and promoting activities needed to place both the technological and institutional control measures into actual practice. The discussants stressed the lack of knowledge relating to health effects of various pollutants and the difficulty in obtaining sound data as an adjunct to effluent standards. The cost-effectiveness of various technological and institutional control measures, will, in the short-term, remain the main factor; in the long term, ecology will be the governing factor in the extent of pollution control. (Auen-Wisconsin)
W77-02053

PANEL 'C' - TOXIC SUBSTANCES,
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
For primary bibliographic entry see Field 6G.
W77-02054

AGRICULTURAL AND OTHER NON-POINT SOURCES OF WATER POLLUTION: NON-POINT SOURCES AND COST EFFECTIVENESS,
Enviro-Control, Inc., Rockville, Md.
P. M. Sprey.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 397-413. 16 tab.

Descriptors: *Water pollution sources, *Pollution abatement, *Cost-benefit analysis, Measurement, Agricultural runoff, Urban runoff, Missouri River, Biochemical oxygen demand, Sediment load, Ammonia, Chemical oxygen demand, Phosphorus, Sewage treatment, Storm runoff, Heavy metals, Adoption of practices.
Identifiers: Non-point pollution sources.

This supplement to the conference provides tables illustrating the per day biological oxygen demand, the sediment load, total dissolved solids, ammonia, chemical oxygen demand, soluble phosphate and total phosphorus load of the Missouri River. Annual BOD budgets at Atlanta, Bucyrus, Cleveland, Washington, D.C., Oakland, Roanoke, Sacramento and San Francisco, assuming 85% removal at sewage treatment plants, and their sources, annual BOD balance, BOD balance during storms, SS balance, and estimated annual heavy metal street loads for Atlanta, Berkeley, Oakland, Sacramento and San Francisco are shown. These are followed with tabulations of cost-effectiveness of BOD removal in dollars per pound, and variations of pollutant inputs as affected by slope and distance. The tabulations are bases for the discussion of the panel on 'Agricultural and Other Non-Point Sources of Water Pollution' related to various agricultural abatement alternatives, such as minimum tillage, side-dressing, slow-release fertilizers, foliar feeding, cover crops, contour plowing, liquid vs. solid fertilizers, and whether their cost-effectiveness can be assessed. Urban non-point loads and abatement alternatives to be considered are sewer separation, treatment at overflow and storm sewers, storage in system and release to treatment plant, new storage, fixing leaks and regulators, bypassing, and sludge disposal, and the variability of their cost-effectiveness. (Auen-Wisconsin)
W77-02057

THE EFFECTS OF WATER POLLUTION FROM NON-POINT SOURCES AS IT RELATES TO THE HEALTH OF MAN,
Health Science Associates, Inc., Bethesda, Md.
M. Ben.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p 415-425.

Descriptors: *Pollutants, *Water pollution effects, *Public health, *Human diseases, Toxins, Chemicals, Pathogenic bacteria, Vectors(Biological), Heavy metals, Viruses, Salmonella.
Identifiers: *Non-point pollution sources.

The pollutants inducing human diseases may be chemical substances (including poisons); pathogenic microorganisms, such as viruses, bacteria, fungi, protozoa, and helminths; and diseases while not truly waterborne are dependent on vectors which are aquatic inhabitants. Most non-point water pollution is generated by industry and agriculture. Carcinogenic contaminants in rain water or carcinogens introduced by natural or industrial substances and attached to vegetation or incorporated into soil are leached into groundwaters. The carcinogenetic effects of arsenic ingestion, barium, cadmium, chromium (as a hexavalent ion), polycyclic aromatic hydrocarbons and many other substances have been identified. Ingestion of copper, cyanides, lead, selenium, silver, nitrates induces various disorders, if not direct toxicity, to man. Among the proto-living agents are viruses, bacteria, protozoa and helminths with a diversity of miscellaneous agents. The living and proto-living agents or their toxins principally pollute waters as a result of contamination with human effluvia such as feces and urine. The primary source, thus, is man with water being the chief final vehicle of transmission. Another link may be in the form of shellfish or other food organisms or vectors which acquire their contaminants from waterborne human dejecta. A list of waterborne pathogens and their epidemiology is included. (Auen-Wisconsin)
W77-02058

THE SAGA OF THE ENVIRONMENTAL STANDARD,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 6G.
W77-02060

NATIONAL EFFLUENT STANDARDS,
Environmental Protection Agency, Washington, D.C.
A. Cywin.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p 461-474.

Descriptors: *Standards, *Federal Water Pollution Control Act, *Industrial wastes, Technology, Toxins, Permits, Industries, Feasibility, *Water quality standards.
Identifiers: *Effluent standards, Zero discharge standards.

The efforts made by the EPA to implement effluent standards in compliance with the 1972 Amendments to the Federal Water Pollution Control Act are outlined and center on standards and guidelines applicable to existing and new industrial dischargers. The requirement of application of the 'best practicable control technology economically achievable, including zero discharges where appropriate' are defined and discussed in application to existing industrial effluent sources. For new sources the legislation prescribes 'the greatest degree of effluent reduction achievable through the application of the best available demonstrated control technology, processes, operating methods, or other alternatives, including where practicable a standard permitting no discharge of pollutants.' The other standards provided by the Act deal with toxic pollutant effluent standards based on a list of toxic pollutants and centered upon the sort of pollutant rather than the type of discharger; and pretreatment of effluent standards to be applied to pollutants which are determined not to be susceptible to treatment by public sewage treatment plants, or which would interfere with their operation. The prescribed terminology and its applications in 1977 and 1983 are discussed. (Auen-Wisconsin)
W77-02061

THE ECONOMICS OF WASTE WATER-AQUACULTURE SYSTEMS,
Woods Hole Oceanographic Institution, Mass.
L. J. Smith, and J. E. Huguenin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 547, Price codes: A02 in paper copy, A01 in microfiche.
In: Institute of Electrical and Electronics Engineers, 1975 Conference 'Engineering in the Ocean Environment OCEAN '75', September 22-

25, 1975, p. 285-293. 1 fig., 5 tab., 16 ref. (Reprint Report November 1975). WHOI-SG-04-5-158-8, MIT-SG-04-5-158-1.

Descriptors: *Comparative costs, *Aquaculture, *Sewage effluents, *Heated water, Powerplants, Nutrient requirements, Oysters, Lobsters, Fertilizers, Capital costs, Operating costs, Feasibility, Profit, Income, Costs, Waste water disposal.
Identifiers: Thermal effluents, Seaweed.

The capital and operating costs of a commercial multi-species aquaculture system using secondary treated sewage effluent as a nutrient source, with an option to utilize free heat from power plant effluent are estimated. Four cases are considered, all based on the sewage-aquaculture system developed at the Woods Hole Oceanographic Institution: (1) systems with sewage as a nutrient source and standard heat sources, (2) systems with sewage and free heat from a power plant, (3) syestems with fertilizer as a nutrient source and standard heat sources, and (4) systems with fertilizer and free power plant heat. The design, costs and revenues are scaled up from a basic size by factors of 10, 100, and 1000. The largest of the systems would be able to handle waste water from a city of 100,000 people. Results indicate that despite uncertainties such as land costs, piping of sewage or thermal effluents, elimination of public health hazards, and system location, the larger scale system using sewage as a nutrient source and free heat from a power plant (or located in a warm climate) can be commercially profitable as long as no traditional heat sources are required. (Luedtke-Wisconsin)
W77-02069

METHOD OF EVALUATING THE CONTENT OF NATURAL RADIOACTIVE ISOTOPES OF THE URANIUM AND THORIUM SERIES IN DRINKING WATER AND FOOD, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-02070

HYGIENIC PROBLEMS OF FORECASTING THE QUALITY OF WATER RESOURCES, (IN RUSSIAN),
K. I. Auklov, L. S. Gurvich, P. M. Vindyukov, G. G. Gangardt, and V. F. Petrov.
Gig Sanit 4, p 35-39, (1975).

Descriptors: *Forecasting, *Water quality, Public health, Sanitary engineering.

Water quality evaluation requires consideration of all indices for which contemporary scientific investigations and practice have established the degree and character of their effect on human health and sanitary water use conditions.–Copyright 1976, Biological Abstracts, Inc.
W77-02071

EQUITY MEASURES FOR EXPLORING WATER QUALITY MANAGEMENT ALTERNATIVES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
E. D. Brill, Jr., J. C. Liebman, and C. S. ReVelle.
Water Resources Research, Vol. 12, No. 5, p 845-851, October 1976. 4 fig, 3 tab, 8 ref.

Descriptors: *Water quality, *Management, *Economic efficiency, *Equity, Constraints, Costs, Alternative planning, Methodology, Optimization, Mathematical models, Systems analysis.
Identifiers: Cost minimization, Delaware Estuary, Waste dischargers, Waste removal costs.

Equity measures are shown to be useful working tools to explore management alternatives for a water quality system. Several example measures of equity are discussed which proved helpful in suggesting new management programs, in identifying critical waste dischargers, in suggesting zones for grouping dischargers, and for understanding given management programs. Given is a review of historical management programs, where the objective is cost minimization. Considered are example equity measures evaluated for Delaware Estuary data utilizing mathematical programming. (Bell-Cornell)
W77-02075

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

ESOO1: VERIFICATION OF MODEL FOR NEW YORK HARBOR,
Environmental Protection Agency, New York. Data Systems Branch.
For primary bibliographic entry see Field 5G.
W77-01791

ANNUAL OPERATION OF A COASTAL GROUNDWATER BASIN AT A PRESCRIBED RELIABILITY LEVEL,
Ministry of Agriculture, Jerusalem (Israel). Hydrological Service.
For primary bibliographic entry see Field 4B.
W77-01882

A MODEL STUDY OF THE EFFECTS OF ARTIFICIAL RECHARGE,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 4B.
W77-01883

OPTIMAL MANAGEMENT OF THE SUBSURFACE ENVIRONMENT,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4B.
W77-01884

DESIGN OF SURFACE WATER DATA NETWORKS FOR REGIONAL INFORMATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W77-01885

MODELE D'AMENAGEMENT ET DE GESTION D'UN GRAND BASSIN HYDROGRAPHIQUE, (A MODEL FOR THE DESIGN AND MANAGEMENT OF A LARGE HYDROGRAPHIC BASIN),
Ecole Nationale Superieure des Mines de Paris, Fontainebleu (France). Center for Geological Information.
For primary bibliographic entry see Field 4A.
W77-01887

IMPACT STUDIES AND THE EVALUATION OF PUBLIC PROJECTS,
British Columbia Univ., Vancouver.
For primary bibliographic entry see Field 6B.
W77-02062

EQUITY MEASURES FOR EXPLORING WATER QUALITY MANAGEMENT ALTERNATIVES,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-02075

6B. Evaluation Process

THE ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM. FIRST YEAR WORK PRODUCT: VOLUME I; THE LEGAL FRAMEWORK: LAKE MICHIGAN AND ITS SHORE,
For primary bibliographic entry see Field 6E.
W77-01689

PLANNING FOR REGIONAL WASTE WATER SYSTEMS,
Massachusetts Dept. of Community Affairs, Boston.
For primary bibliographic entry see Field 5D.
W77-01690

THE RIVER'S REACH. CONNECTICUT RIVER SUPPLEMENTAL FLOOD MANAGEMENT STUDY. OUTDOOR RECREATION IMPACTS. PHASE II. PART V,
Bureau of Outdoor Recreation, Philadelphia, Pa. Northeast Regional Office.
J. J. Comiskey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 005, Price codes: A05 in paper copy, A01 in microfiche. Prepared for the New England River Basins Commission, July 1975. 93 p, 1 fig, 17 maps, 5 tab. CRS-NERBC-BOR 2.1B(4.2.1).

Descriptors: *Non-structural alternatives, *Recreation, *Reservoirs, *Dams, *Flood plains, *Connecticut River, Channels, Government, Planning, New Hampshire, Vermont, Connecticut, Massachusetts, Recreation demand.
Identifiers: *Connecticut River Basin, Ammonoosuc River(NH), Ashuelot River(NH), Sugar River(NH), White River(VT), Passumpsic River(VT), Deerfield River(MA), Beaver Brook(NH).

The potential for meeting recreation needs that are associated with alternative plans proposed to reduce flood damages in the Connecticut River Basin is examined. Both structural and non-structural techniques for flood plain management are proposed. Structural considerations include evaluations of dams and reservoirs; non-structural alternatives include the recreational potential of flood plains and lands adjacent to river channels. Major findings were that 1 of 7 dams proposed by the Corps of Engineers exhibited high degrees of recreation potential, the Bethlehem junction site on the Ammonoosuc River in northern NH. Four dams have moderate potential for recreation: the Honey Hill site on the Ashuelot River in southern NH, the Claremont site on the Sugar River in central NH, the Gaysville site on the White River in central Vermont and the Victory site on the Passumpsic River in northern Vermont. The Meadow site on the Deerfield River in central MA and the Beaver Brook site in southern NH showed little recreation potential. The report concluded that recreation resources in the Connecticut Basin are generally underdeveloped. Estimated future recreation demand cannot be accommodated by present facilities. There is a need for planning and coordination among levels of government and the private sector in the Connecticut Valley to preserve recreation, open space and natural values. (Gentry-North Carolina)
W77-01694

INLAND WATER POLLUTION.
NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
For primary bibliographic entry see Field 5G.
W77-01697

GRAPHIC DISPLAY OF WATER RIGHTS AND WATER RESOURCE INFORMATION FOR THE

YAKIMA RIVER BASIN AS AN AID TO DECISION-MAKING,
Central Washington State Coll., Ellensburg. Dept. of Geography.
J. Q. Ressler.
Completion Report, October 20, 1976. 98 p., 23 fig., 9 tab., 5 append. OWRT A-075-WASH(1). 143-34-10E-3996-5301.

Descriptors: River basins, *Maps, *Social participation, *Graphical methods, Decision making, *Attitudes, *Washington, *Water rights, Surveys, Planning, Aesthetics.
Identifiers: *Citizen participation, *Yakima River basin(Wash).

It is hypothesized that ready availability of graphic displays (maps) of water resource information will stimulate citizens to request the materials and then formulate opinions which will motivate them to participate more fully in the resource planning and allocation decision-making process. Test of the hypothesis was undertaken by preparing maps of water resource and related data, announcing their availability through the news media, and distributing sets of maps accompanied by returnable questionnaires to those who requested the information. Poor response to publicity led to alternative distribution of the materials to a selected list of citizens and persons professionally concerned with resource planning and development. Questionnaires of the first of two sets were returned at a rate of 34%; those from the second set at a lower rate. Conclusions reached from questionnaire analysis are: (1) Professionals are more responsive to availability and receipt of information of this type than are lay persons; (2) To be useful to the lay persons, maps should not be too highly generalized nor data too abstractly displayed; (3) Use of color appears important to holding lay persons' interest; (4) High quality (esthetically pleasing) graphic design has a favorable impact on interest by both lay persons and professionals; and (5) when these conditions exist the probabilities are greater that citizens will be motivated to participate in the resource planning and allocation decision-making process.
W77-01808

ESTIMATION OF AMENITY VALUES AS OPPORTUNITY COSTS FOR ENERGY-RELATED WATER USE IN MONTANA,
Montana State Univ., Bozeman. Dept. of Agricultural Economics.
R. L. Stroup, M. D. Copeland, and R. R. Rucker.
Montana University Joint Water Resources Research Center, Bozeman, Report No. 81, August 1976. 51 p, 4 fig, 2 tab, 41 ref, 2 append. OWRT B-045-MONT(1), 14-34-0001-6027.

Descriptors: *Economics, Recreation, *Fishing, *Recreation demand, Water demand, Costs, Water utilization, *Montana, *Resource allocation, Social values, Attitudes.
Identifiers: *Yellowstone River(Mont), Opportunity costs, Amenity values.

It has become increasingly important that the value of water resources in non-consumptive uses, such as recreation, be quantified. Numerous methods of site evaluation have been attempted--all encountering problems stemming from the use of proxies for consumers' willingness to pay for site use. A fundamentally more direct method is proposed here: a fee experiment. No method of valuing angler access to a limited site can measure the value of fishing in general, fishing on an entire river, the option value of fishing, nor the non-fishing attributes of site conservation. Yet equity, efficiency, and Montana law all require that economic evaluation, of the type obtainable by the proposed study, be made to facilitate rational allocation of resources. A fee experiment for a specific site on the Yellowstone River is specified in detail. This method avoids the problems associated with the use of proxies for consumer willingness to pay. (Stuart-Montana State)
W77-01811

OPTIMAL MANAGEMENT OF THE SUBSURFACE ENVIRONMENT,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4B.
W77-01884

MODELE D'AMENAGEMENT ET DE GESTION D'UN GRAND BASSIN HYDROGRAPHIQUE, (A MODEL FOR THE DESIGN AND MANAGEMENT OF A LARGE HYDROGRAPHIC BASIN),
Ecole Nationale Superieure des Mines de Paris, Fontainebleu (France). Center for Geological Information.
For primary bibliographic entry see Field 4A.
W77-01887

FORECASTS AND THE ROLE OF ALTERNATIVE FUTURES,
American Society of Civil Engineers, New York. Div. of Water Resources Planning and Management.
R. C. Tucker.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR2, p 365-383, Proceedings paper No. 12578, November 1976. 3 tab.

Descriptors: *Water resources, *Water utilization, *Water demand, *Forecasting, *Planning, Social needs, Water policy.
Identifiers: *Alternative futures, Food industry.

A review of previous water resource forecasts by the Kerr Commission, the Water Resources Council, and the USGS is presented. Comparison among the forecasts indicate widely ranging figures depending on the underlying assumptions. Various factors affecting forecasts are presented along with conceptual problems in forecasting. Rarely have the impacts of alternative policy assumptions, life styles, or technological change been fully considered. Furthermore, forecasts are typically viewed as 'requirements' rather than as 'desires' which must be examined for their benefits and costs. Developing a single 'most likely' forecast is rejected in favor of separate 'alternative futures.' Typical assumptions for various alternative futures are presented encompassing population growth and distribution, food and fiber production, income distribution, national economic efficiency, lifestyle changes, and various means of developing, using, and conserving water resources. (Bell-Cornell)
W77-01890

COLORADO RIVER BASIN DEVELOPMENT AND ITS POTENTIAL IMPACT ON TRIBAL LIFE,
Colorado Univ., Boulder. Dept. of Anthropology.
R. A. Hackenberg.
Human Organization, Vol. 35, No. 3., p 303-311, Fall, 1976. 2 ref.

Descriptors: *Colorado River Basin, *Indian reservations, *Social change, *Social impact, *Economic impact, Federal government, Water policy, Competing uses, Arizona, Water resources development, Irrigation, River basins, Arid lands.
Identifiers: *Papago Indians.

Irrigation, mineral extraction and energy exploitation of the Colorado River Basin have converted a wasteland into potentially one of nation's richest areas. American Indians own a substantial portion of this region, but due to erosion, subnormal rainfall and poor planning of water resources, large portions of reservation land have become unfit for either farming or stockraising. Thus, many Indians have broken ties with the land and moved to cities or to the largest villages on the reservations. Attempts to reverse this pattern and the factors working against its reversal are discussed. It is concluded that the social change in Indian economic values and work habits took place more rapidly than water resource development. Federal Government programs for Indians have failed in the past because of a lack of understanding of the dimensions of social change and the failure to appreciate the adverse nature of the total environment. The same mistakes have already been made in plans for Colorado River Basin development. Although substantial amounts of wealth will be created within the Indian Reservations it will not, for several reasons, be distributed among tribal members and there will be no substantial alteration in the quality of Indian life. (Jamail-Arizona)
W77-01903

BENEFITS FROM WATER POLLUTION ABATEMENT, BEACH CLOSINGS AND REOPENINGS.
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 5G.
W77-01985

BENEFITS FROM WATER POLLUTION ABATEMENT, COASTAL WATERS, (VOLUMES 1 AND 2).
Florida State Univ., Tallahassee. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-01986

FUTURE ENVIRONMENTAL NEEDS AND COSTS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 6G.
W77-02044

ECONOMICS OF ENVIRONMENTAL CONTROL POLICIES,
Atomic Energy Commission, Washington, D. C. Bureau of Licensing.
For primary bibliographic entry see Field 6G.
W77-02047

INTRODUCTORY REMARKS ON ENVIRONMENTAL CONTROL STRATEGIES,
Mitre Corp., McLean, Va.
For primary bibliographic entry see Field 6G.
W77-02048

ENVIRONMENTALIST VIEW OF 'NONDEGRADATION,' 'BEST PRACTICABLE TECHNOLOGY' AND 'BEST AVAILABLE TECHNOLOGY',
Sierra Club, Washington, D. C.
For primary bibliographic entry see Field 6G.
W77-02049

INDUSTRIALIST VIEW,
Chamber of Commerce of the United States, Washington, D. C.
For primary bibliographic entry see Field 6G.
W77-02050

PANEL 'A' - AUTOMOTIVE EMISSIONS,
For primary bibliographic entry see Field 6G.
W77-02052

IMPACT STUDIES AND THE EVALUATION OF PUBLIC PROJECTS,
British Columbia Univ., Vancouver.
W. G. Waters.
Annals of Regional Science, Vol X, No 1, p 98-103, 1975. 4 ref.

Descriptors: *Estimated benefits, *Planning, *Evaluation, Economic impact, Social impact, Project planning, Alternative planning, Decision making, Methodology.
Identifiers: *Impact studies, *Evaluation studies.

The different purposes and orientation of impact studies and evaluation studies are contrasted, and their respective roles in the planning and evaluation of public projects are outlined. An impact study is defined as a descriptive, quantitative account of the regional impact of spending on a project. Interactions of various sectors of the economy are identified and reverberations of project spending through subsequent rounds of spending are estimated using multiplier and input-output analysis. An impact study estimates the effects of the project upon projected spending patterns and industrial and demographic trends, but by itself, does not reveal the worth or value of the project to society. In contrast, evaluation studies are intended to assess the relative merits of one project to another. Two major adjustments are necessary for evaluation studies. First, the social or planning objective function must be clearly identified, in order to effectively weigh the contribution of a project's impact toward these objectives. Second, it is necessary to estimate the opportunities foregone, in order to accurately access the true economic costs of a project. (Luedtke-Wisconsin)
W77-02062

SURVEY OF THE CRITICAL NATURAL, HISTORIC AND RECREATIONAL AREAS IN KENTUCKY.
Mayes, Sudderth and Etheredge, Inc., Lexington, Ky.
Kentucky Dept. for Natural Resources and Environmental Protection, Frankfort, Div. of Water Resources, Technical Memorandum, October 1975. 48 p, 3 tab.

Descriptors: *Sites, *Kentucky, *Data collections, *Recreation facilities, Surveys, Mapping, Archeology, History, Parks, Hunting, Camp sites, Scenery, Wildlife habitats, Wild rivers, Forests, Fishing.

Certain categories of historical, natural, and recreational features in Kentucky are identified and displayed graphically (map overlays) to allow water resources planners to be able to consider these areas for preservation and protection. Categories of information covered include: historical sites, covered bridges, archeological sites, state parks, forests and shrines, major local and private parks, wild rivers, historic trails, areas of environmental significance, national parks, wildlife refuges, recreation areas, hunting areas, trout waters, and youth camps. This information was obtained from the Kentucky Departments of Parks, Fish and Wildlife Resources, and Natural Resources, and Environmental Protection, the U.S. Forest Service, Tennessee Valley Authority, Corps of Engineers, and Kentucky Heritage Commission. This data base was compiled as a guide to water resource planners, among others, particularly with respect to conservation of historic and archeological sites. (Luedtke-Wisconsin)
W77-02063

'COMMON PROPERTY' AS A CONCEPT IN NATURAL RESOURCES POLICY,
California Univ., Berkeley. Dept. of Agricultural Economics.
S. V. Ciriacy-Wantrup, and R. C. Bishop.
Natural Resources Journal, Vol 15, p 713-727, October 1975. 38 ref.

Descriptors: *Natural resources, *Welfare(Economics), *Management, Decision making, Groundwater, Planning, Fish management, Grazing, Forest management, Resource allocation, Legal aspects, Public rights.
Identifiers: *Common property, Public trust doctrine.

The role of the common property concept and its policy implications as a tool in the economic analysis and solution of natural resources policy problems is examined. Common property is defined as resources subject to the rights of common use, but not to a specific use right held by several owners. The concept is considered as a second level decision system, aimed at maintaining and increasing welfare by continuously influencing decision making on the first level, the operating level, under constantly changing conditions. Whether welfare decreased under common property institutions or whether earlier societies over-used their resources because of common ownership is examined by looking back into economic history. It is concluded that the concept has been capable of satisfactory performance in the management of such natural resources as grazing and forest land. Elements of the common property concept are also being employed currently to solve groundwater and fisheries resource problems. It is suggested that this concept be broadened to include the application of the public trust doctrine to natural resources policy problems. This approach would have the advantage of forcing bureaucracies to take the interests of all common owners into account, and allow quality criteria to be incorporated into resource problem solutions. (Luedtke-Wisconsin)
W77-02064

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

EVALUATION OF AGRICULTURAL ADJUSTMENT TO IRRIGATION WATER SALINITY: A CASE STUDY FOR PINAL COUNTY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 3C.
W77-01909

WATER POLLUTION CONTROL ACT OF 1972, ECONOMIC IMPACTS, CHEMICAL AND ALLIED INDUSTRIES,
International Research and Technology Corp., Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-01960

CAPITAL MARKETS AND WATER QUALITY NEEDS: 1975-1985.
Conference Board, Inc., New York.
For primary bibliographic entry see Field 5G.
W77-01967

WATER POLLUTION ABATEMENT TECHNOLOGY, CAPABILITIES AND COSTS, PUBLICLY OWNED TREATMENT WORKS, (VOLUMES 1, 2 AND 3).
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W77-01982

THE ECONOMICS OF FISHING AND MODERN CAPITAL THEORY: A SIMPLIFIED APPROACH,
British Columbia Univ., Vancouver. Dept. of Mathematics.
C. W. Clark, and G. R. Munro.
Journal of Environmental Economics and Management, Vol. 2, No. 2, p. 92-106, 1975. 3 fig., 39 ref.

Descriptors: *Econometrics, *Mathematical models, *Fisheries, Optimization, Model studies, Theoretical analysis.
Identifiers: *Capital theory, Optimal control theory.

It is demonstrated that with the aid of optimal control theory, fisheries economics can be cast in a capital-theoretic framework yielding results which are both general and readily comprehensible. Beginning with the Schaefer model, a simple linear autonomous model of optimal fishery management is developed. An optimal stationary equilibrium exists, determined by a golden-rule equation modified by the discount rate and the marginal stock effect. The optimal management policy that emerges is that of adjusting the stock level toward the stationary equilibrium as rapidly as possible. The model is then extended by relaxing, in turn, the assumptions of autonomy and linearity. While the general theoretical development can be readily extended in both cases, the simplicity of the linear autonomous theory is lost because of the emergence of blocked intervals and multiple equilibria complications. These models, while developed for fishing, can be extended to other areas of renewable resource management. (Luedtke-Wisconsin)
W77-02068

THE ECONOMICS OF WASTE WATER-AQUACULTURE SYSTEMS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5G.
W77-02069

6D. Water Demand

WATER IN GENERAL AND ITS INDUSTRIAL USE IN PARTICULAR (ALLGEMEINES UEBER DAS WASSER UND BESONDERES UEBER SEINEN INDUSTRIELLEN GEBRAUCH),
For primary bibliographic entry see Field 3E.
W77-01661

RURAL RESIDENTIAL WATER DEMAND: AN ECONOMETRIC AND SIMULATION ANALYSIS,
Kentucky Univ., Lexington. Dept. of Agricultural Economics.
O. C. Gruenwald, C. T. Haan, D. L. Debertin, and D. I. Carey.
Water Resources Bulletin of the American Water Resources, Vol. 12, No. 5, p 951-961, October, 1976. 2 fig, 4 tab, 13 ref.

Descriptors: *Water supply, *Water demand, *Water costs, Water utilization, Water wells, Reservoir design, Simulation analysis, Reservoir storage, Data collections, *Kentucky, Prices, Costs, *Simulation analysis, *Econometrics.
Identifiers: *Rural residential water demand, Reservoir capacities, Water use theory.

Data collected from rural water districts in Kentucky shows that rural residential water demand is a decreasing function of price. This finding contests the 'water is different' philosophy and supports the use of demand analysis in water management. Based on simulation analysis, it is concluded that price may be used to reduce reservoir capacity requirements and thus make it possible to meet demands with smaller water supply reservoirs or possibly delay the enlargements of an existing reservoir. Total cost for water supply may be reduced by charging more for the water and building a smaller reservoir. (Heiss-NWWA)
W77-01770

FORECASTS AND THE ROLE OF ALTERNATIVE FUTURES,
American Society of Civil Engineers, New York. Div. of Water Resources Planning and Management.
For primary bibliographic entry see Field 6B.
W77-01890

6E. Water Law and Institutions

ASSESSMENT OF WATER AND RELATED LAND RESOURCES, 1975. INITIAL IDENTIFICATION OF WATER AND RELATED LAND PROBLEMS IN NEW ENGLAND,
New England River Basins Commission, Boston, Mass.

For primary bibliographic entry see Field 6G.
W77-01688

THE ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM. FIRST YEAR WORK PRODUCT: VOLUME I; THE LEGAL FRAMEWORK: LAKE MICHIGAN AND ITS SHORE,
R. L. Wexler, and M. D. Newsom.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 135, Price codes: A12 in paper copy, A01 in microfiche. Prepared for the Northeastern Illinois Planning Commission and Coastal Zone Management Program. June 1975. 249 p, 2 append.

Descriptors: *Law, *Legislation, *Coasts, *Lake Michigan, *Illinois, Legal aspects, Government, Ordinances, Statutes, Public law, Coastal engineering, Shore protection, Land use, Land use control.
Identifiers: *Legal analysis, *Legal framework, *Illinois Coastal Zone Management Program, *Coastal Zone Management Act of 1972, *Coastal zone management, Home rule.

Changing concepts of public purpose and benefits as well as the extreme pressures of urbanization in northeastern IL have led to issues and conflicts which have been resolved too frequently in the courts. The intent of this report is to provide a comprehensive legal resource base for the development of a coastal zone management program designed to protect, preserve and enhance Lake Michigan and its shores. The Coastal Zone Management Act of 1972 and the changing role of the Army Corps of Engineers from its narrow 'navigation' orientation to the present one of broader concerns for the environment are described briefly. Based upon examination of hundreds of statutes and judicial opinions, the report identifies 'what the law is' in the context of the critical issues of shore and water, including property rights, the police power, public trust, police power mergers and public trust, governmental organization and authority. In spite of the substantial litigation which has taken place and the numerous statutes that have been passed, a coherent and comprehensive view of the Lake and its environs has not emerged from the actions of the courts and the legislature. Although a summary is presented the authors say 'no summary can adequately verbalize the legal resource basis for the findings which follow. It is critical to full understanding of these findings that the entire report be read and understood by all those who seek to apply the findings to any given situation.' The police power of the state and the doctrine of public trust are seen as important factors in the emerging legal policy for the IL coastal zone. (Hufschmidt-North Carolina)
W77-01689

A REPORT TO THE NEW ENGLAND RIVER BASINS COMMISSION ON NON-STRUCTURAL MEASURES FOR FLOOD PLAIN AND FLOOD DAMAGE MANAGEMENT WITH APPLICATION TO THE CONNECTICUT RIVER BASIN SUPPLEMENTAL FLOOD MANAGEMENT STUDY. PHASE II. THE FORMULATION AND EVALUATION OF SPECIFIC ALTERNATIVES,
Cheney, Miller, Ellis and Associates, Inc., Putnam, Conn.
For primary bibliographic entry see Field 6F.
W77-01696

INLAND WATER POLLUTION.
NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
For primary bibliographic entry see Field 5G.
W77-01697

PROJECT PROPOSAL FOR SURFACE-MINED LAND ENHANCEMENT (SMILE),
Federal Energy Administration, Washington, D.C. Office of Coal.
For primary bibliographic entry see Field 5G.
W77-01699

THE POTENTIAL USE OF RESERVATIONS TO INTERNATIONAL AGREEMENTS PRODUCED BY THE THIRD UNITED NATIONS CONFERENCE ON THE LAW OF THE SEA,
Louisiana State Univ. Law Center, Baton Rouge.
H. G. Knight.
Sea Grant Reprint No. LSU-R-75-024. Reprinted from Policy Issues in Ocean Law published by West Publishing Company. 53 p, 26 ref. SG-2-35231.

Descriptors: *Law of the Sea, *International Law, *Resources development, Water resources, *International waters, *Pollution abatement, Oceans, Reservation doctrine, Conferences, Planning, Management, Continental Shelf, Natural resources.
Identifiers: *Outer Continental Shelf, Ocean policy, Ocean law, Ocean resources.

The purpose is to identify and discuss issues relating to the possible use of reservations to a treaty or treaties resulting from the Third United Nations Conference on the Law of the Sea. Two different aspects of the issue are examined: the desirability from any particular nation's point of view of its being able to make reservations to a law of the sea treaty or treaties; and the desirability from any particular nation's point of view of other nations being able to make such reservations. United States procedural and policy objectives in the law of the sea negotiations have been used in order to frame the issues and provide a basis for concrete analysis. Part B of this paper identifies those aspects of United States ocean policy which are directly related to the issue of reservations to international agreements. Part C contains a discussion of the use of reservations and the effects which their use might have and Part D discusses some specific 'non-agreement' situations which might emerge from the Third Conference and suggests how reservations might be applied in those situations. (NOAA)
W77-01705

THE THIRD UNITED NATIONS LAW OF THE SEA CONFERENCE: CARACAS,
Louisiana State Univ. Law Center, Baton Rouge.
H. G. Knight.
Sea Grant Reprint No. LSU-R-74-028. Reprinted from: Fieldstaff Reports, East Coast-South America Series, Vol 18, No. 1, (Venezuela), October 1974. 18 p, 10 fig, 2 tab, 15 ref, 2 append.

Descriptors: *Conferences, *Law of the Sea, *Oceans, *Resources development, *International law, Water resources, *Pollution abatement, Econmics, Continental Shelf, Planning, Management, Natural resources.
Identifiers: *Outer Continental Shelf, Ocean space, Ocean resources.

This Fieldstaff Report is one of a continuing series on international affairs and major global issues. The first substantive session of the Third United Nations Conference on the Law of the Sea was held in Caracas, Venezuela, from June 20-August 29, 1974. Although widely heralded, it appears to have served little purpose other than to demonstrate the apparent inability or unwillingness of the community of nations to come to grips with the issues and to negotiate acceptable solutions to the critical resource and national security problems spawned by recent technological developments related to the use of the ocean. The precedents set in Caracas may have significant implications for world energy, food, population, and environment issues. No international agreements on law of the sea were negotiated in Caracas, nor was there any appreciable moderation of the polarized national positions on the many issues under consideration. The issues remain unresolved while technology and national food and energy crises continue to develop. (NOAA)
W77-01706

NEARLY 50,000 NEBRASKA WELLS CAUSING SOME CONCERN.
For primary bibliographic entry see Field 4B.
W77-01765

A MANUAL OF LAWS, REGULATIONS, AND INSTITUTIONS FOR CONTROL OF GROUND WATER POLLUTION,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W77-01776

GRAPHIC DISPLAY OF WATER RIGHTS AND WATER RESOURCE INFORMATION FOR THE YAKIMA RIVER BASIN AS AN AID TO DECISION-MAKING,
Central Washington State Coll., Ellensburg. Dept. of Geography.
For primary bibliographic entry see Field 6B.
W77-01808

ALTERNATIVES IN AREA MANAGEMENT OF GROUNDWATER,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 4B.
W77-01819

COLORADO RIVER BASIN DEVELOPMENT AND ITS POTENTIAL IMPACT ON TRIBAL LIFE,
Colorado Univ., Boulder. Dept. of Anthropology.
For primary bibliographic entry see Field 6B.
W77-01903

WATER POLLUTION CONTROL ACT OF 1972, COSTS AND CAPABILITIES, WATER TREATMENT SYSTEMS,
American Water Works Association Denver, Colo.
For primary bibliographic entry see Field 5D.
W77-01963

NOVEMBER 1975 STAFF DRAFT REPORT: REVIEW AND COMMENT,
National Research Council, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-01965

CAPITAL MARKETS AND WATER QUALITY NEEDS: 1975-1985.
Conference Board, Inc., New York.
For primary bibliographic entry see Field 5G.
W77-01967

WATER POLLUTION CONTROL ACT OF 1972, INSTITUTIONAL ASSESSMENT, DIGEST OF LEGAL ISSUES.
Bureau of National Affairs, Inc., Washington, D.C. Environment and Safety Research Service.
For primary bibliographic entry see Field 5G.
W77-01974

DIRECTORY TO U.S. GEOLOGICAL SURVEY PROGRAM ACTIVITIES IN COASTAL AREAS, 1974-76,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2L.
W77-02011

GOVERNMENT VIEW,
For primary bibliographic entry see Field 6G.
W77-02051

SUBSTANTIVE RIGHTS UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT,
Syracuse Univ., N.Y. Dept. of Law and Public Policy.
J. P. Karp.
American Busin[illegible] Law Journal, Vol. 13, p. 289-314, 1976. 53 ref.

Descriptors: *Environmental effects, *Legal review, *Judicial decisions, *Federal project policy, Legal aspects, Legislation.
Identifiers: *National Environmental Policy Act, Environmental Impact Statements, Calvert Cliffs case, Overton Park case.

The development of substantive legal review under the National Environmetal Policy Act (NEPA) is traced. Early judicial interpretations centered on Section 102(2)(c), which set out the procedural mandates for preparing environmental impact statements (EIS) considering NEPA only as a 'full disclosure' act. This began to change with the Calvert Cliffs case, which not only suggested a review of the agency's decision on its merits, but also established a test by which the court could measure its decision. In the Gillham Dam case which followed, the court recognized that the EIS was not an end in itself, but a means of using all practical means to preserve and enhance the environment, as provided in Section 101. The current judicial standard, delineated in the Overton Park case, calls for a review of whether the actual balance of benefits and costs in the EIS or in supplemental data is arbitrary or gives sufficient weight to environmental values. While court decisions based on this standard have quite often been rather general, it is illustrated that the potential for very specific substantive review exists within sections of NEPA. A major difficulty in the application of the cost-benefit analysis balancing concept is the lack of quantifiable environmental values. (Luedtke-Wisconsin)
W77-02067

6F. Nonstructural Alternatives

ASSESSMENT OF WATER AND RELATED LAND RESOURCES, 1975. INITIAL IDENTIFICATION OF WATER AND RELATED LAND PROBLEMS IN NEW ENGLAND,
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 6G.
W77-01688

THE RIVER'S REACH. CONNECTICUT RIVER SUPPLEMENTAL FLOOD MANAGEMENT STUDY. OUTDOOR RECREATION IMPACTS. PHASE II. PART V,
Bureau of Outdoor Recreation, Philadelphia, Pa. Northeast Regional Office.
For primary bibliographic entry see Field 6B.
W77-01694

CONNECTICUT RIVER BASIN PROGRAM. PHASE II. WATER QUALITY IMPACT EVALUATIONS ON FLOOD PROTECTION MEASURES FOR THE CONNECTICUT RIVER SUPPLEMENTAL STUDY.
Environmental Protection Agency, Boston, Mass.
For primary bibliographic entry see Field 5G.
W77-01695

A REPORT TO THE NEW ENGLAND RIVER BASINS COMMISSION ON NON-STRUCTURAL MEASURES FOR FLOOD PLAIN AND FLOOD DAMAGE MANAGEMENT WITH APPLICATION TO THE CONNECTICUT RIVER BASIN SUPPLEMENTAL FLOOD MANAGEMENT STUDY. PHASE II. THE FORMULATION AND EVALUATION OF SPECIFIC ALTERNATIVES,
Cheney, Miller, Ellis and Associates, Inc., Putnam, Conn.
P. B. Cheney.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 003, Price codes: A07 in paper copy, A01 in microfiche. Prepared for the New England River Basins Commission, November 1974. 120 p, 2 fig, 39 tab, 51 ref.

Descriptors: *Non-structural alernatives, *Flood plains, *Flood protection, *Flood plain insurance, *Flood proofing, *Warning systems, *Land use, *Land clearing, *Costs, *Benefits, Flood control, Zoning, Land management, Connecticut River.
Identifiers: *Standard Project Flood, *Intermediate Regional Flood, *20-year flood, *50-year flood, 100-year flood, 1000-year flood, *Connecticut River Basin.

The costs and flood damage reduction benefits on non-structural alternatives for flood plain management in the Connecticut River Basin are formulated and evaluated. Three programs were proposed whose management objectives included: (1) Reduce the amount of increasing damages; (2) Prevent increasing damages; (3) Reduce existing damages; (4) Maintain natural storage. Non-structural program elements in Program A and B included land use controls, floodproofing, clearance, flood warning and emergency plans, and flood insurance. The non-structural program elements of Program C included land use regulation, land acquisition, relocation, floodproofing, flood insurance, flood warning system and education and information. Proposals within Program A and B varied when considering a Standard Project Flood or an Intermediate Regional Flood. Similarly Program C varied when considering a 20-year, 50-year or 100-year flood. Total first costs and damage reduction benefits for Program A were $23,755 and $8,529; for B $388,657 and $11,534; and for C $8,706 and $8,028. Benefits did not include non-flood damage benefits, such as open space. Programs A and B which call for relocation and clearance within the 100-year flood plain cannot be justified on the basis of flood damage reduction benefits alone. Program C which applies only to the 20-year flood plain is more likely to be economically feasible because of a smaller land area subject to floods, and may be instituted alone or in conjunction with structural measures. (Gentry-North Carolina)
W77-01696

6G. Ecologic Impact Of Water Development

ENVIRONMENTAL FACTORS OF HUMAN LEUKEMIAS, (IN POLISH),
For primary bibliographic entry see Field 5C.
W77-01562

ASSESSMENT OF WATER AND RELATED LAND RESOURCES, 1975. INITIAL IDENTIFICATION OF WATER AND RELATED LAND PROBLEMS IN NEW ENGLAND,
New England River Basins Commission, Boston, Mass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 614, Price codes: A11 in paper copy, A01 in microfiche. Prepared for the Water Resources Council, Washington, D. C., Technical Memorandum, November 1975. 363 p, 7 fig, 5 tab, 230 ref, 6 append.

Descriptors: *Water management(Applied), *Planning, *Energy, *Water supply, *Water quality, *Recreation, *Finance, *New England, *Connecticut, *New Hampshire, *Vermont, *Massachusetts, *Maine, Groundwater, Institutions, Water treatment, Flood control, *Rhode Island.
Identifiers: *Regional Assessment Advisory Committee, *New England River Basins Commission, *Long Island Sound, *New York-Lake Champlain Drainage Basin, Citizen participation, Urban land uses.

Existing and potential water and land related problems are given for the six New England states, and Clinton and Essex counties in New York, and those portions of Long Island bordering Long Island Sound. States were subdivided along political or hydrological boundaries. For each state an overview is given, followed by brief descriptions of problems of water supply and quality, flooding, drainage, erosion and sedimentation, land use, recreation, preservation of resources and institutional and financing needs regarding water and related lands. A Regional Assessment Advisory Committee, comprised of representatives from states, planning commissions, and federal agencies, provided the expertise in identifying problems. General concerns throughout the region include the following problem issues: impact of energy-related operations on water supplies; intra- or inter-state disagreements over interbasin water transfers; lack of funding for local treatment facilities, flood control, recreation facilities and acquisition or preservation of natural lands; need to coordinate state and local programs to avoid overlapping responsibilities and duplication of effort; the lack of implementation and enforcement of existing programs and laws; and the need for improved resource data acquisition. (Gentry-North Carolina)
W77-01688

RESEARCH NEEDS FOR THE LAKE TAHOE BASIN,
Lake Tahoe Area Research Coordination Board, South Lake Tahoe, Calif.
B. Medford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 486, Price codes: A03 in paper copy, A01 in microfiche. Prepared for the National Science Foundation, December 1974. 29 p, 8 fig. NSF Grant GT-39556.

Descriptors: *Environment, *Air quality, *Water quality, *Land, *Vegetation, *Fish, *Wildlife, *Economic growth, *Recreation, *Resource systems, Eutrophication, Erosion, Sedimentation, Inventory, Planning, California, *Research priorities.
Identifiers: *Environmental management, *Lake Tahoe Basin, Lake Tahoe Area Research Coordination Board.

This tentative assessment of research needs is intended to provide a channel of communication between researchers, sponsors and research users. Trends relating to environmental quality in the Lake Tahoe area are the conflicting use of natural resources, the failure of the market system to account for long-range costs such as pollution, and the democratization of recreation leading to increased demand for recreation opportunities and facilities, and expansion of recreation home ownership. Problems afflicting the Lake Tahoe Basin are: the threat of irreversible water pollution, degradation of the pure air, overdevelopment in places, under-development elsewhere, traffic congestion, crowded facilities, severe seasonal fluctuations in the economy, a shortage of housing in middle and low income categories, uncontrolled erosion, damaged vegetation along highways, and a high frequency of social problems. Six broad categories of research needs are surveyed: air, water, land and vegetation, fish and wildlife, social sciences, and resource systems. (Gentry-North Carolina)
W77-01693

CONNECTICUT RIVER BASIN PROGRAM. PHASE II. WATER QUALITY IMPACT

EVALUATIONS ON FLOOD PROTECTION MEASURES FOR THE CONNECTICUT RIVER SUPPLEMENTAL STUDY.
Environmental Protection Agency, Boston, Mass.
For primary bibliographic entry see Field 5G.
W77-01695

ANALYSIS OF MARINE MAMMAL REMOTE SENSING DATA,
Johns Hopkins Univ., Baltimore, Md.
G. C. Ray, and D. Wartzok.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 3-56, April 1976. 1 fig, 10 tab, 24 ref, 5 append.

Descriptors: *Cold regions, *Habitats, *Distrib ion patterns, *Resources development, *Mammals, *Remote sensing, *Baseline studies, *Ecology, Marine animals, Continental shelf.
Identifiers: *Outer Continental shelf, Odobenus rosmarus, Walrus, Balaena mysticetus, Delphinaptarus leucas, Oil development, Oil exploration, Petroleum resources.

This report consists of studies which deal with comparative analyses of data obtained on marine mammals by remote sensing. One study provides a comparison of the accuracy and precision of visual and photographic aerial censuses of ice-inhabiting marine mammals based on results of a simulated flight. Another deals with synergistic remote sensing of walrus and walrus habitats. (Sinha-OEIS)
W77-01825

BASELINE CHARACTERIZATION: MARINE MAMMALS,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
C. H. Fiscus, and H. W. Braham.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 57-119, April 1976. 18 fig, 12 tab, 44 ref. R7120804.

Descriptors: *Continental shelf, *Migration patterns, *Resources development, *Mammals, *Baseline studies, *Cold regions, *Environmental effects, *Ecology, Oil pollution, Water quality, Water pollution, Leases.
Identifiers: *Outer Continental Shelf, Bering Sea, Feeding grounds, *Pinnipeds, *Cetaceans, Seals, Sea lions, Petroleum, Oil development, Oil exploration, Petroleum resources.

The baseline objectives were to identify the kinds of marine mammal species inhabiting the Bering Sea and specifically increase knowledge relevant to the distribution and abundance of pinnipeds and cetaceans. The principal pinneped species inhabiting the Bering Sea are: ringed seal, ribbon seal, largha seal, bearded seal, northern sea lion, and spotted or harbor seal. When the sea ice recedes in the fall, some of these species feed pelagically while others feed near-shore. Many use the sea ice during spring and summer breeding season. The geographic distribution and abundance of all species during these critical periods must be determined, especially as they relate to gas-oil lease sites. Cetaceans frequent the Bering Sea for feeding and migration throughout the year. Times of migration, migration routes, and feeding grounds must be identified for each species before management decisions are implemented with regard to petroleum resource development. (Sinha-OEIS)
W77-01826

ABUNDANCE AND SEASONAL DISTRIBUTION OF MARINE MAMMALS IN THE GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
C. H. Fiscus, and H. W. Braham.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 121-139, April 1976. 36 ref. R7120806.

Descriptors: *Alaska, *Resources development, *Mammals, *Cold regions, *Environmental effects, *Baseline studies, *Ecology, *Distribution patterns, *Habitats, *Oil industry, *Oil pollution, Hazards, Continental Shelf, Seasonal, Transportation, Water resources.
Identifiers: *Outer Continental Shelf, Oil development, Oil exploration, Petroleum resources, Whales, Seals, Sea lions, Tanker traffic.

The baseline objectives of this project were to provide a better understanding of the relative seasonal distribution and abundance of marine mammal species. These objectives will be accomplished by integrating sighting records taken aboard NAA ships and chartered vessels working in and crossing through the Gulf of Alaska; data from aircraft surveys collected by supporting OCEAP projects (e.g. Alaska Department of Fish and Game); and from historical whaling and sealing records. The northern and coastal regions of the Gulf of Alaska are expected to be important areas where oil-gas research and tanker traffic will occur. These areas also represent localized habitats for many marine mammals (e.g. northern sea lion, Eumetopias jubatus) as well as an area for seasonal migrations (e.g. California gray whale, Eschrichtius robustus). The Gulf of Alaska, therefore, represents an important area of study for understanding the interaction of marine mammal resources and oil-gas resource development. (Sinha-OEIS)
W77-01827

RESOURCE ASSESSMENT: ABUNDANCE AND SEASONAL DISTRIBUTION OF BOWHEAD AND BELUKHA WHALES - BERING SEA,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
C. H. Fiscus, and H. W. Braham.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 141-157, April 1976. 1 fig, 1 tab, 22 ref. R7120807.

Descriptors: *Resources development, *Cold regions, *Environmental effects, *Baseline studies, *Ecology, *Oil pollution, *Distribution patterns, *Migration patterns, Leases, Mammals, Water quality, Seasonal, Habitats, Continental Shelf, Hazards.
Identifiers: *Outer Continental Shelf, *Bering Sea, *Population density, Whales, Walruses, Seals, Balaena mysticetus, Delphinapterus leucas, Odobenus rosmarus, Erignathus barbatus, Chukchi Sea, Oil development, *Oil exploration, Petroleum resources.

Proposed oil and gas lease sites occur in the northern Bering Sea west from Norton Sound, and the southern Chukchi Sea west from Kotzebue Sound. Bowhead (Balaena mysticetus) and belukha (Delphinapterus leucas) whales pass through these areas from about March through July and again in the fall. These animals apparently winter in the Bering Sea, although those portions of the population that do are unknown. Calving of bowhead is believed to occur in the northern Bering Sea in May, but again, no reliable data are known to exist. Since adverse affects to these animals could result from oil or gas related perturbations, identification of population centers, seasonal movements and potential areas of production are major considerations in development energy resource management decisions. (Sinha-OEIS)
W77-01828

ABUNDANCE AND SEASONAL DISTRIBUTION OF BOWHEAD WHALES AND BELUKHA,
National Marine Fisheries Service, Seattle, Wash. Marine Mammal Div., and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
C. H. Fiscus, W. M. Marquette, and H. W. Braham.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 159-182, April 1976. 2 fig, 2 tab, 21 ref. R7120808.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Mammals, *Oil spills, *Oil pollution, *Migration patterns, *Distribution patterns, Leases, Water quality, Water pollution, Continental Shelf, Hazards, Alaska.
Identifiers: *Outer Continental Shelf, Bering Sea, Whales, Beaufort Sea, Balaena mysticetus, Delphinapterus leucas, Ice fronts, Polynya, Feeding grounds, Population management, Oil development, Oil exploration, Petroleum resources.

Bowhead (Balaena mysticetus) and belukha (Delphinapterus leucas) whales are thought to be associated with the ice front and polynya systems during the winter in the Bering Sea. They migrate northward in the spring to summer feeding areas in the Chukchi and Beaufort Seas. These areas and areas where animals can be found throughout the year, must be defined so that population estimates can be obtained providing a basis for evaluating conservation efforts, and to provide information necessary for management of the populations. The Beaufort Sea 'Basin' oil-gas lease sites are in the pathway of migrating bowhead and belukha whales. Oil spills and other disturbances of the marine environment could drastically affect migrating animals, especially in shore leads, even if pollution is kept local to lease sites. The effects of oil development on the biology and ecology of these animals at this critical time in their annual cycle must be evaluated, before any rational oil lease development plan can be implemented. (Sinha-OEIS)
W77-01829

MORBIDITY AND MORTALITY OF MARINE MAMMALS - BERING SEA,
Alaska Univ., College. Inst. of Artic Biology; and Alaska Univ., College. Inst. of Marine Science.
F. H. Fay.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 183-246, April 1976. 10 fig, 2 tab, 23 ref, append.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Mammals, *Mortality, *Oil pollution, *Water pollution effects, *Pathology, Alaska, Continental Shelf, Hazards, Water qualty .
Identifiers: *Outer Continental Shelf, Bering Sea, Necropsy, Petroleum resources, Oil development, Oil exploration.

This study was designed to provide baseline information on the incidence and causes of pathological conditions in marine mammal populations of the Bering Sea that will be useful in evaluating future impacts of petroleum-related activities in that region. Primary emphasis is placed on surveys of distribution and numbers of beached carcasses of moribund and dead animals and on necropsy of such specimens for determination of causes of illness and death. (Sinha-OEIS)

W77-01830

BIOLOGY OF THE HARBOR SEAL, PHOCA VITULINA RICHARDI, IN THE GULF OF ALASKA,
Alaska Dept. of Fish and Game, Anchorage.
K. Pitcher, and D. Calkins.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 247-261, April 1976. 2 fig, 5 tab, 10 ref. 03-5-022-69.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Oil pollution, *Mortality, *Mammals, Biology, Alaska, Food habits, Growth rates, Seasonal, Hazards, Continental Shelf.
Identifiers: *Outer Continental Shelf, *Harbor seals, Phoca vitulina richardi, Population composition, Oil development, Oil exploration, Petroleum resources, Trophic relationships.

Several phases of the biology and ecology of the harbor seal in the Gulf of Alaska are investigated. Basic objectives include: examination of food habits and trophic relationships; investigation of population productivity; and examination of growth, development and seasonal condition. Other objectives include collection of data on population composition, seasonal distribution, sex and age segregation and use of critical habitat. There are a number of potential adverse effects of oil and gas development on harbor seal populations. These include: direct injury through contact with oil; disturbance, particularly during vulnerable periods such as pupping; increased exposure to environmental contaminants; reduced basic productivity of the food web; and direct mortality of prey species. (Sinha-OEIS)
W77-01831

THE NATURAL HISTORY AND ECOLOGY OF THE BEARDED SEAL (ERIGNATHUS BARBATUS) AND THE RINGED SEAL (PHOCA (PUSA) HISPIDA),
Alaska Dept. of Fish and Game, Fairbanks.
J. J. Burns, and T. J. Eley, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 263-294, April 1976. 4 fig, 6 tab, 37 ref. 03-5-022-53.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Mammals, *Oil pollution, Alaska, Habitats, Ecosystems, Water quality, Water pollution, Hazards, Continental Shelf, Marine animals, Sea ice.
Identifiers: *Outer Continental Shelf, Seals, Bearded seals, Ringed seals, Erignathus barbatus, Phoca(Pusa) hispida, Bering Sea, Chukchi Sea, Beaufort Sea, Oil development, Oil exploration, Petroleum resources.

Ringed seals, Phoca hispida and bearded seals, Erignathus barbatus are major components of the marine mammal fauna of the Bering, Chukchi and Beaufort Seas. The broad objectives of this project are to obtain baseline information about the natural history and ecology of ringed and bearded seals. These species occupy vastly different ecological niches within the ice dominated marine systems in question. The ringed seal is a small, widely distributed and very abundant species which mainly occurs in areas of extensive, relatively thick and stable sea ice. Ringed seals feed mainly on zooplankton, the smaller shrimp and demersal fishes. Bearded seals are the largest of the northern seals, are widely distributed, but occur in the drifting ice. They feed almost exclusively on benthic organisms. The implications with respect to oil and gas development are basically that we will be able to recognize how, when, where and why certain activities may have proximal or ultimate effects on these two important species. (Sinha-OEIS)
W77-01832

AN AERIAL CENSUS OF SPOTTED SEALS, PHOCA VITULINA LARGHA,
Alaska Dept. of Fish and Game, Fairbanks.
J. J. Burns, and S. J. Harbo, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 295-302, April 1976. 14 ref. 03-5-022-53.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Mammals, *Oil pollution, *Census, *Population, Alaska, Distribution patterns, Leases, Marine animals, Continental Shelf, Hazards.
Identifiers: *Outer Continental Shelf, Aerial surveys, Spotted seals, Phoca vitulina largha, Ice fronts, Bering Sea, Oil development, Oil exploration, Petroleum resources.

The distribution and density as well as the size of the population of the spotted seal, Phoca vitulina largha, are determined. Spotted seals, which are a major component of the Bering Sea marine mammal fauna, are mainly restricted to the ice front during late winter and spring. This distribution means that they are concentrated in three proposed lease areas: Bristol Bay, St. George Basin and Navarin Basin. A baseline assessment of distribution and total number of these seals constitutes part of the information required to evaluate the potential impact of OCS oil and gas development along the edge of the Bering Sea Continental Shelf. (Sinha-OEIS)
W77-01833

TROPHIC RELATIONSHIPS AMONG ICE INHABITING PHOCID SEALS,
Alaska Dept. of Fish and Game, Fairbanks.
L. F. Lowry, and J. J. Burns.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 303-332, April 1976. 1 fig, 5 tab, 26 ref. 03-5-022-53.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Mammals, *Oil pollution, *Water pollution effects, Diets, Leases, Population, Food habits, Alaska, Continental Shelf, Hazards.
Identifiers: *Outer Continental Shelf, Trophic relationships, Phocid seals, Foraging, Ice habitats, Bering Sea, Chukchi Sea, Beaufort Sea, Ringed seals, Pinnipeds, Phoca(Pusa) hispida, Phoca vitulina largha, Phoca(Histriophoca) fasciata, Erignathus barbatus, Oil development, Oil exploration, Petroleum resources.

Ice inhabiting seals are highly visible, numerous and economically and sociologically important species in the Bering, Chukchi, and Beaufort marine ecosystems. A complete understanding of the role of these seals in the trophic structure of these ecosystems is crucial to the evaluation of potential impacts of OCS development. As a first step, the important items in the diet of each species in all areas at all times of year must be determined. Key areas and times of foraging must be determined and will have direct bearing on the suitability of various areas for leasing. When key prey species have been enumerated and data correlated with information on the distribution, abundance and natural history of these prey species (from other projects), an evaluation of effects of OCS development on the food base of the seals can be made. By understanding the trophic relationships among ice inhabiting seals and other consumers in the system, indirect effects of OCS development (e.g. those favoring population increase of potential food resource competitors) can be estimated. (Sinha-OEIS)

W77-01834

ASSESSMENT OF THE DISTRIBUTION AND ABUNDANCE OF SEA OTTERS ALONG THE KENAI PENINSULA, KAMISHAK BAY AND THE KODIAK ARCHIPELAGO,
Alaska Dept. of Fish and Game, Fairbanks.
K. B. Schneider.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 333-358, April 1976. 9 fig, 4 tab, 11 ref. 03-5-022-69.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Mammals, *Oil pollution, *Otters, *Distribution patterns, *Water pollution effects, Aquatic population, Alaska, Population, Hazards, Continental Shelf.
Identifiers: *Outer Continental Shelf, Sea otters, Kenai Peninsula, Kodiak Archipelago, Oil development, Oil exploration, Petroleum resources.

Aerial and boat surveys were conducted around the Kenai Peninsula and the Kodiak Archipelago to determine the present distribution and relative abundance of sea otters. Sea otter populations in these areas are relatively small but are expanding their range. The potential for adverse impacts of OCS activities on sea otters appears high. Sea otters are more vulnerable to direct oiling than any other species of marine mammal and they may be indirectly affected by chronic low levels of pollution through the food chain. Where populations are expanding their range, a localized influence could retard repopulation of large areas. Sea otters exert a significant impact on nearshore marine communities. It is necessary to consider the history of sea otter occupation of an area when studies of these communities are conducted. Information being gathered under this project will be used to trace the patterns of range expansion, predict future trends, identify those areas where OCS activities would have greatest impact on the population and provide a basis for evaluating the sea otter's role in changes in marine communities. (Sinha-OEIS)
W77-01835

DISTRIBUTION AND ABUNDANCE OF SEA OTTERS IN SOUTHWESTERN BRISTOL BAY,
Alaska Dept. of Fish and Game, Fairbanks.
K. Schneider.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 359-369, April 1976. 1 fig, 1 tab, 5 ref. 03-5-022-69.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Mammals, *Oil pollution, *Otters, *Distribution patterns, Leases, Population, Hazards, Alaska, Continental Shelf.
Identifiers: *Outer Continental Shelf, Sea otters, Bristol Bay, Alaska Peninsula, Unimak Island, Oil development, Oil exploration, Petroleum resources.

A large population of sea otters occupies approximately 3000 square miles of habitat north of Unimak Island and the Alaska Peninsula. At present the approximate distribution of the population is known but no reliable estimates of its size are available. Sea otters are particularly vulnerable to the direct effects of oiling and may be indirectly affected through the food chain by chronic low levels of pollution. This population inhabits waters in and around proposed OCS lease areas. The objective of this project is to systematically survey the range of population to determine the distribution of sea otters and estimate their numbers. The survey should provide a basis for designating critical areas and for monitoring changes in distribution and numbers. (Sinha-OEIS)

W77-01836

POPULATION ASSESSMENT, ECOLOGY AND TROPHIC RELATIONSHIPS OF STELLER SEA LIONS IN THE GULF OF ALASKA,
Alaska Dept. of Fish and Game, Anchorage.
D. Calkins, and K. Pitcher.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 371-386, April 1976. 2 fig, 4 tab, 26 ref. 03-5-022-69.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Mammals, *Oil pollution, Distribution patterns, *Pathology, *Water pollution effects, Food habits, Hazards, Alaska, Continental Shelf.
Identifiers: *Outer Continental Shelf, *Trophic relationships, Gulf of Alaska, Population assessment, Steller sea lions, Eumetopias jubatus, Oil development, Oil exploration, Petroleum resources.

The investigation of Steller sea lions (Eumetopias jubatus) in the Gulf of Alaska is a broadly based undertaking designed to provide basic information about population status, distribution, movement patterns, segregation, use of critical habitat, population composition and dynamics, growth, pathology, food habits and trophic relationships. The sea lion is a dominant high level carnivore in the marine system of the Gulf of Alaska. Oil and gas exploration and development have the potential of greatly affecting basic productivity and the abundance of prey species. Therefore the importance of establishing trophic relationships is evident. Oil and gas exploration and development could possibly increase levels of various environmental contaminants which are concentrated in top-level consumers such as the sea lion. Baseline levels should be established. (Sinha-OEIS)
W77-01837

THE RELATIONSHIPS OF MARINE MAMMAL DISTRIBUTIONS, DENSITIES AND ACTIVITIES TO SEA ICE CONDITIONS,
Alaska Dept. of Fish and Game, Fairbanks.
J. J. Burns, L. H. Shapiro, and F. H. Fay.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 1. Marine Mammals, p 387-430, April 1976. 15 fig, 21 ref. 03-5-022-55.

Descriptors: *Cold regions, *Environmental effects, *Resources development, *Baseline studies, *Ecology, *Mammals, *Oil pollution, *Sea ice, *Water pollution effects, *Leases, Alaska, Ice cover, Habitats, Population, Migration, Hazards, Biology, Continental Shelf.
Identifiers: *Outer Continental Shelf, Bering Sea, Chukchi Sea, Beaufort Sea, Seals, Spotted seals, Ribbon seals, Polar bears, Walrus, Whales, Oil development, Oil exploration, Petroleum resources, Ursus maritimus, Odobenus rosmarus, Phoca vitulina largha, Phoca hispida, Phoca fasciata, Erignathus barbatus, Delphinapterus leucas, Balaena mysticetus.

Petroleum development in the Bering, Chukchi and Beaufort seas will, without exception, take place in regions of seasonal sea ice cover in which ice-associated marine mammals occur abundantly and are involved in major annual biological events. As examples, proposed lease areas in Bristol Bay, St. Gerge Basin and Havarin Basin are in areas seasonally covered by the ice front in which spotted and ribbon seals concentrate in winter to give birth and nurture their pups. The Hope Basin is within the migration route of all ice-associated marine mammals which winter in the Bering Sea. The Beaufort Sea lease area is occupied by ringed seals and polar bears almost all year. The relevance of this project to problems of petroleum development is that we are attempting to determine what major recognizable marine mammal habitats exist; how these habitats are spatially and temporally distributed; to what extent the various mammal species depend on them and how important aspects of the biology of marine mammals are related to the physical changes in a major component of their environment - ice. The answers to these questions are necessary in order to determine what species are likely to be affected by development, in what numbers and to some extent, how. (Sinha-OEIS)
W77-01838

ENVIRONMENTAL ASSESSMENT OF THE BERING SEA: BENTHIC BIOLOGY,
Alaska Univ., College. Inst. of Marine Science.
H. M. Feder, G. Mueller, S. C. Jewett, M. Hoberg, and K. Hafliner.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 5. Fish, Plankton, Benthos, Littoral, p 1-218, April 1976. 3 fig, 6 tab, 44 ref, 3 append. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Benthos, *Oil spills, *Oil pollution, *Water pollution effects, Data collections, Sedimentation, Alaska, Continental Shelf, Invertebrates, Mortality.
Identifiers: *Outer Continental Shelf, *Bering Sea, Trophic relationships, Echinoderms, Indicator species, Oil development, Oil exploration, Petroleum resources.

The operations connected with oil exploration, production, and transportation in the Bering Sea present a wide spectrum of potential dangers to the marine environment. The benthic biological program in the Bering Sea during its first year emphasized the development of a qualitative and quantitative inventory of species as part of the overall examination of the biological, physical and chemical components of those portions of the shelf slated for oil exploration and drilling activity. In addition, development of computer programs in the Gulf of Alaska, designed to quantitatively assess assemblages of benthis species on the shelf there, are applicable to the Bering Sea. The effects of oil pollution on subtidal benthic organisms have been seriously neglected, although a few studies, conducted after serious oil spills, have been published. Infaunal benthic organisms tend to remain in pace and consequently can be useful as an indicator species for disturbed areas. Data indicating the effects of oils on most subtidal benthic invertebrates are fragmentary. A direct relationship between trophic structure (feeding type) and bottom stability has been demonstrated. A diesel-fuel oil spill resulted in oil becoming adsorbed on sediment particles with the resultant mortality of many deposit feeders living on sublittoral muds. Bottom stability was altered with the death of these organisms, and a new complex of species became established in the altered substratum. Many members of the infauna of the Bering Sea are deposit feeders; thus, oil-related mortality of these species could result in a changed near-bottom sedimentary regime with alteration of species. (Sinha-OEIS)
W77-01839

THE DISTRIBUTION, ABUNDANCE, DIVERSITY, AND PRODUCTIVITY OF THE WESTERN BEAUFORT SEA BENTHOS,
Oregon State Univ., Corvallis. School of Oceanography.
A. G. Carey, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 5. Fish, Plankton, Benthos, Littoral, p 219-255, April 1976. 6 fig, 38 ref. 03-5-022-68.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Benthos, *Oil spills, *Oil pollution, *Water pollution effects, Alaska, Continental Shelf, Distribution patterns, Ice cover, Data collections, Coasts, Hazards.
Identifiers: *Outer Continental Shelf, *Beaufort Sea, Oil development, Oil exploration, Petroleum resources.

Extensive drilling for oil and gas on the Alaskan and Canadian North Slope creates the potential for high environmental pollution and degradation in the coastal area. The basic structure of the coastal ecosystem could be adversely affected in local areas, and the food web disrupted by oil spills toxic to phytoplankton, the primary producers, and to zooplankton (including larvae of benthic invertebrates). In the inner shelf environment, the bottom could be a sink for heavier oils, and perhaps include large amounts of toxic volatiles because of the colder temperatures found in the Beaufort Sea. Coastal benthic fauna could have high mortalities caused by a spill so carnivores, including fish, whales, seals, and polar bears, would find less to feed on. Summaries and data analyses of the present and future assembled material on the benthos in the Beaufort Sea will provide a basis for evaluating the potential effects of possible oil spills and general environmental pollution caused by the necessary supportive activities by man in this relatively unspoiled environment. (Sinha-OEIS)
W77-01840

SUMMARIZATION OF EXISTING LITERATURE AND UNPUBLISHED DATA ON THE DISTRIBUTION, ABUNDANCE, AND LIFE HISTORIES OF BENTHIC ORGANISMS,
Oregon State Univ. Corvallis. School of Oceanography.
A. G. Carey, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 5. Fish, Plankton, Benthos, Littoral, p 257-712, April 1976. Numerous charts and tables. Includes bibliography p 608 703 and p 709 711. 03-5-022-68.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Benthos, *Oil spills, *Oil pollution, *Water pollution, effects, Alaska, Bibliographies, Life history studies, Data collections, Continental Shelf, Hazards.
Identifiers: *Outer Continental Shelf, Beaufort Sea, North Slope, Oil development, Oil exploration, Petroleum resources.

The western Beaufort Sea has not been extensively sampled until recently. The objectives of this effort are to summarize existing published and unpublished work and to infer conclusions about the species composition and distribution of the benthos. The natural variability that exists will also be estimated, and the control that environmental conditions have on the ecosystem will be investigated, using correlations of the environmental variables and species abundance information. Life histories of the dominant species and their reproductive activity are important aspects when assessing particular times of the year or development stages when organisms are especially vulnerable to pollutants, and in estimating their capacity to repopulate an area. These objectives will establish a reference state from which future studies may evaluate deviations, and determine the impact of oil and gas development on the benthic component of the ecosystem. The results compiled to date on the summarization and analysis of existing literature and unpublished data on the distribution, abundance, and life histories of benthic organisms of the Beaufort Sea are included. (Sinha-OEIS)
W77-01841

OUTER CONTINENTAL SHELF ASSESSMENT PROJECT. HERRING SPAWNING SURVEY - SOUTHERN BERING SEA,
Alaska Dept. of Fish and Game, Kodiak.
P. B. Jackson, and I. M. Warner.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 6. Fish, Plankton, Benthos, Littoral, p 1-16, April 1976. 1 tab, 1 fig, 3 ref.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Habitats, *Oil spills, *Oil pollution, *Water pollution effects, Herring, Spawning, Marine fish, Distribution patterns, Alaska, Continental Shelf.
Identifiers: *Outer Continental Shelf, *Bering Sea, Pacific herring, Clupea pallasii, Smelt, Osmeridias, Capelin, Mallotus villoseis, Chukchi Sea, Oil development, Oil exploration, Petroleum resources.

The spawning ground utilization by forage fishes in the Bering Sea, principally, the Pacific herring (Clupea pallasii), and capelin (Mellotus villoseis) is investigated. The current state of knowledge is largely generalized in nature with little completed work in relation to the physical habitat of either species. The northernmost extension of Pacific herring currently known is Cape Thompson in the Chukchi Sea, while Capelin and boreal smelt (Osmerus eperlanus) are known to occur north of Demarcation Point near the Alaska-Canadian border in the Beaufort Sea. Herring spawning activities were seen and documented in FY 76 within the study area. Habitat types were recorded for future surveys. Osmerids are thought to be more important as spawners between Ugashik Bay and Cape Sarichef on the north Alaska peninsula. Foreign fishing harvest levels were investigated and discussed. Interviews were conducted with coastal residents to determine magnitude of forage fishes within the villages socio/economic needs. (Sinha-OEIS)
W77-01842

OUTER CONTINENTAL SHELF ASSESSMENT PROJECT. RAZOR CLAM HABITAT SURVEY - GULF OF ALASKA,
Alaska Dept. of Fish and Game, Kodiak.
R. J. Kaiser, and D. Konigsberg.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 6. Fish, Plankton, Benthos, Littoral, p 17-31, April 1976. 4 fig, 1 tab, 6 ref.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Habitats, *Oil spills, *Oil pollution, *Water pollution effects, Alaska, Clams, Beaches, Distribution patterns, Continental Shelf.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Pacific razor clams, Siliqua patula(Dixon), Oil development, Oil exploration, Petroleum resources.

This study of the Pacific razor clam, Siliqua patula (Dixon), is being undertaken to define the extent of the razor clam populations in the Gulf of Alaska between Unimak Bight and the 139 deg West longitude. The importance of the Pacific razor clam must be considered in terms of recreational and commercial utilization prior to any petroleum development along the Gulf coast. Most of the important known razor clam beaches are near areas of current or proposed oil development. The habitat of this species on the open surf swept sandy beaches of the coast make it highly vulnerable to problems associated with oil exploration and development. (Sinha-OEIS)
W77-01843

A DESCRIPTION AND NUMERICAL ANALYSIS OF THE FACTORS AFFECTING THE PROCESSES OF PRODUCTION IN THE GULF OF ALASKA,
Washington Univ., Seattle.
G. C. Anderson, R. K. Lam, and B. Booth.
In: Environmental Assessment of the Alaskan Continetal Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 6. Fish, Plankton, Benthos, Littoral, p 35-58, April 1976. 6 fig, 1 tab, 74 ref. NOAA-03-5-022-67.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Oil spills, *Oil pollution, *Water pollution effects, Alaska, Primary productivity, Data collections, Continental Shelf.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Oil development, Oil exploration, Petroleum resources.

This study emcompasses the pelagic ecosystem in the Gulf of Alaska, concentrating on the first step of the food chain. The specific objectives are: to search the existing literature and unpublished data in order to compile baseline information on factors of importance to phytoplankton production; to synthesize the baseline information into a description of the seasonal and geographic distribution of phytoplankton standing stock, production and related physical and checmical factors insofar as the existing data are suitable; to use the data to initialize a numerical model and to determine the combinations of process submodels which lead to distributions in the dependent variable that are in agreement with observations; and to test the sensitivity of the results of the 'standard' run to changes in the submodels and independent variables. The results of this study may then be used to compare effects after petroleum development with the natural range of values in the pelagic ecosystems and the types of modifications to the plant community which might be associated with a large scale oil spill can be suggested. The effects of an oil spill on the productivity of underlying waters would be short term effects. There is also a possibility of long term effects of petroleum development in the Gulf of Alaska. One would be the introduction of different oil fractions into the food chain. Some of these fractions may not be toxic or organisms low on the food chain, but could be toxic to man. (Sinha-OEIS)
W77-01844

REVIEW OF LITERATURE AND HISTORICAL DATA ON NON-SALMONID PELAGIC FISHERIES RESOURCES OF THE EASTERN BERING SEA AND GULF OF ALASKA,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
W. T. Pereyra, and M. O. Nelson.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 6. Fish, Plankton, Benthos, Littoral, p 59-73, April 1976. 3 append. R7120811 and R7120812.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Oil spills, *Oil pollution, *Water pollution effects, *Fisheries, Alaska, Distribution patterns, Bibliographies.
Identifiers: *Outer Continental Shelf, Pelagic fisheries, Literature searches, Fisheries resources, Bering Sea, Oil development, Oil exploration, Petroleum resources.

The research to date indicates significant amounts of information are available for relatively few species and that, aside from the compilation of occurrence records for a variety of relatively rare species, the study will focus on approximately 20 species. This study is expected to provide the only organized review and synthesis of information available on the subject species in the area of concern. Approximately 600 references on non-salmonid pelagic fishes have been located and examined. Of these, approximately 430 were of indirect value, 225 were found to contain information useful to the narrative report and about 100 will be included in the annotated portion of the bibliography. (Sinha-OEIS)
W77-01845

BASELINE CHARACTERIZATION, LITTORAL BIOTA, GULF OF ALASKA AND BERING SEA,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.
S. T. Zimmerman, and T. R. Merrell, Jr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 6. Fish, Plankton, Benthos, Littoral, p 75-584, April 1976. 17 fig, 7 tab, 10 append. Chiefly data tables and references.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Oil spills, *Oil pollution, *Water pollution, *Water pollution effects, *Distribution patterns, Alaska, Littoral biota, Habitats, Fisheries, Toxicity, Bibliographies, Continental Shelf.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Bering Sea, Intertidal biota, Subtidal biota, Oil development, Oil exploration, Petroleum resources.

A general characterization and inventory of the intertidal and shallow subtidal biota in the region from Yakutat in the eastern Gulf of Alaska to Cape Newenham in northern Bristol Bay is provided. Two objectives in the study were: to determine the distribution of the major habitat types (sandy, muddy, rocky, etc.) along the coastline; and to determine the densities and distribution of biotic populations within these habitat types. The distribution of organisms within habitat types is being determined by field parties from the Auke Bay Fisheries Laboratory (ABFL), with logistical assistance from the Pacific Marine Center. Additional projects include an extensive literature survey, a study of the accumulation of biotic debris in the 'drift zone,' the estimation of variability between sampling areas, and more intensive studies at sites which may receive major impact from oil exploration in the eastern Gulf of Alaska. The intertidal and shallow subtidal areas provide one of the major points of contact between floating or dissolved pollutants and the marine substrate. The majority of biota in these areas are non-motile and are unable to avoid repeated exposure as oil or similar compounds come ashore. In addition to the obvious problems of suffocation or acute toxicity, other effects may occur. For instance, removal of littoral populations may cause changes in the feeding patterns of marine birds and mammals. It may also change the reproductive potential of certain marine fishes. (Sinha-OEIS)
W77-01846

PLANKTON OF THE GULF OF ALASKA - ICHTHYOPLANKTON,
Washington Univ., Seattle. Dept. of Oceanography.
T. S. English.
In: Environmental Assessment of the Alaska Continental Shelf, Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 1-30, April 1976. 3 fig, 11 tab. 03-5-022-67-TA8 No. 4.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Distribution patterns, *Plankton, Alaska, Fish eggs, Oil pollution, Continental Shelf.
Identifiers: *Outer Continental Shelf, *Ichthyoplankton, *Fish larvae, Gulf of Alaska, Oil exploration, *Oil development, Petroleum resources.

This report provides information on the seasonal density distributions and environmental requirements for principal species of ichthyoplankton in

the Gulf of Alaska. Details are given on the data collections, station locations. Summaries are given of the taxonomic categories of fish eggs and fish larvae found during the various survey cruises. Baseline studies should provide the frame reference to determine the effects of resources development on the outer continental shelf, in particular with reference to oil and gas developmental activities. (Sinha-OEIS)
W77-01847

INITIAL ZOOPLANKTON INVESTIGATIONS,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
D. M. Damkaer.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 31-56, April 1976. 5 fig, 3 tab.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Continental Shelf, *Zooplankton, Alaska, Vertical distribution, Distribution patterns.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Prince William Sound, Oil exploration, Oil development, Petroleum resources.

Zooplankton was sampled during two cruises to the northern Gulf of Alaska: in Prince William Sound in October, and on the continental shelf in November 1975. The zooplankton studies are part of a comprehensive environmental assessment of the Alaskan shelf, in light of present and future offshore petroleum resource development. The fauna of the subarctic Pacific region is not particularly diverse, when compared to warm-water plankton. About 100 species from the fall and early winter were identified. During late 1975, the most common zooplankton species were found to have vertical distributions fitting into four basic patterns, including an important group of species that spend the day in deep water, and rise into the surface layer at night. If pollutants are introduced into the surface layers, the pollutants may not be contained, but could quickly be transferred to deeper water by these active migrations. (Sinha-OEIS)
W77-01848

PHYTOPLANKTON AND PRIMARY PRODUCTIVITY IN THE NORTHEAST GULF OF ALASKA,
National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
J. D. Larrance.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 57-93, April 1976. 6 fig, 3 tab, 14 ref.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effect, *Oil pollution, *Continental shelf, *Phytoplankton, *Primary productivity, *Alaska, Diatoms, Light intensity.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Standing stocks, Silicoflagellates, Skeletonema costatus, Dictyocha fibula, Thalassionema nitzschioides, Fragillariopsis sp., Oil exploration, Oil development, Petroleum resources.

The chief objective of the phytoplankton and primary productivity studies in the Gulf of Alaska for the first year of OCSEAP was to provide a baseline of phytoplankton standing stocks and rates of primary production. The investigations were also intended to identify the environmental factors controlling production and to determine quantitative relationships between these factors and production. The baseline includes the species compositions and population densities of the the phytoplankton, rate of carbon assimilation, nutrient concentrations, intensity of light available to the cells, concentrations of chlorophyll a and phaeopigments, and other related variables. The chief environmental factor controlling production appeared to be light available to the cells. Nutrient concentrations were sufficient to sustain vigorous phytoplankton growth. Dominant groups showing distinct distributions included a silico-flagellate, Dictyocha fibula, and the diatoms Thalassionema nitzschioides, Fragillariopsis sp., and Skeletonema costatus. Repopulation of phytoplankton following damaging contamination may result in a species composition much different than the previous one. Productivity may also be significantly different than previous levels. (Sinha-OEIS)
W77-01849

ZOOPLANKTON AND MICRONEKTON STUDIES IN THE BERING -CHUKCHI/BEAUFORT SEAS,
Alaska Univ., College. Inst. of Marine Science.
R. T. Cooney.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 95-161, April 1976. 13 fig, 2 tab, 7 ref, 2 append. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Continental shelf, *Zooplankton, Alaska, Trophic levels.
Identifiers: *Outer Continental Shelf, Bering Sea, Bristol Bay, Micronekton, Species composition, Oil exploration, Oil development, Petroleum resources.

Details of progress and results from field studies initiated in May-June 1975, as one part of the overall BLM/NOAA environmental assessment of Alaska's continental shelf are given. The distribution, abundance, and species composition of the zooplankton and micronekton communities of the southeastern Bering Sea are discussed in as much detail the data set permits, with emphasis on the late summer season. A well-defined 'discontinuity' in species composition appears at mid-shelf in central Bristol Bay; few oceanic species are encountered as adults, but east of this location larvae and juveniles are present. It is surmised that physical oceanographic measurements taken at this time but not yet available will substantiate the presence of a boundary feature at this location. Since the zooplankton community includes the early life history forms of most commercially valuable subsistence species in the Bering Sea and provides forage for higher trophic levels, the implications of offshore oil development are certainly obvious. Critical times of year, locations, and biological associations which define the 'survival windows' for selected species must be understood before hypotheses describing the most probable impact can be structured. (Sinha-OEIS)
W77-01850

PHYTOPLANKTON STUDIES - BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
V. Alexander.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 163-210, April 1976. 11 fig, 5 tab. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Continental Shelf, *Phytoplankton, *Food chains, Alaska, Ice cover, Population.
Identifiers: *Outer Continental Shelf, Bering Sea, Ice pack, Oil exploration, Oil development, Petroleum resources.

The principal task involved was the study of the dynamics of phytoplankton populations, particularly along the edge of the seasonal ice-pack in the Bering Sea, and with emphasis on describing the probably effects of petroleum development impact. The southeastern Bering Sea is a highly productive area in terms of fisheries, and as such is very important to the Alaskan economy. In addition, the Bering Sea shelf as well as the southeast shelf-break area supports large populations of birds and mammals. The phytoplankton primary productivity which supports all the activity higher in the food chain is high seasonal in this area, and its timing and the mechanisms of food chain transfer are probably extremely important to maintaining the integrity of the system. It is essential that the exact nature of the highly seasonal phytoplankton production peaks is known, the major pathways and rates of transfer of this food chain base to higher levels is understood. (Sinha-OEIS)
W77-01851

BASELINE STUDIES OF DEMERSAL RESOURCES OF THE NORTHERN GULF OF ALASKA SHELF AND SLOPE: AN HISTORICAL PREVIEW,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
W. T. Pereyra, L. Ronholt, and S. Hughes.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 211-217, April 1976.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Continental Shelf, Alaska, *Demersal fish, Growth rates, Fishes, Shellfish.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Age composition, Oil exploration, Oil development, Petroleum resources.

The objectives are to provide an historical perspective on the demersal fish and shellfish resources residing in the continental shelf and slope waters of the Gulf of Alaska between the Semidi Islands (157 degrees W. long.) and Yakutat Bay (140 degrees W. long.) and to provide growth and age composition information on selected demersal fish species of importance to man as food resources. The field data collected in 1975 on distribution of demersal fish and shellfish resources has been analyzed so that it may be compared with the results of earlier surveys. All the age structures (about 5,000) collected from 7 species of demersal fishes in 1975 have been read by the Age Determination Unit of the Northwest Fisheries Center; the information has been entered on ADP cards and the cards checked for errors. (Sinha-OEIS)
W77-01852

BASELINE STUDIES OF DEMERSAL RESOURCES OF THE EASTERN BERING SEA SHELF AND SLOPE,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
W. T. Pereyra, J. E. Reeves, and R. G. Bakkala.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 219-242, April 1976. 6 fig, 3 tab.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Continental Shelf, Alaska, *Demersal fish, Population, Fishes, Crabs.
Identifiers: *Outer Continental Shelf, *Bering Sea, *Catch statistics, *Commercial fisheries, Oil exploration, Oil development, Petroleum resources.

A three vessel synoptic survey of demersal resources was conducted in August-October 1975 in the eastern Bering Sea. A total of 654 stations were sampled. Catches or subsamples of catches occurring in standard one-half hour bottom tows were identified, weighed, enumerated and, for selected species, other biological data collected. Approximately 150,000 ADP cards were generated from the fall 1975 survey. These data are presently being analyzed. Summarization of pertinent biological literature on selected species of demersal fishes, crabs, and snails was undertaken. These summaries cover distribution, abundance, life history, population attributes, and exploitation patterns. Analysis of historical data on demersal fishes and crabs is underway. These data include catch statistics from commercial fisheries in the Bering Sea, U.S. and foreign research cruises, and other data sets. (Sinha-OEIS)
W77-01853

BEAUFORT SEA ESTUARINE FISHERY STUDY,
Alaska Dept. of Fish and Game, Fairbanks. Sport Fish Div.
T. N. Bendock.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7, Fish, Plankton, Benthos, Littoral, p 243-261, April 1976. 2 fig, 1 tab, 20 ref. 03-5-022-69.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Estuaries, *Anadromous fish, Continental Shelf, Alaska, Habitats, Fish.
Identifiers: *Outer Continental Shelf, *Beaufort Sea, *Species composition, Salmonidae, Osmeridae, Gadidae, Cottidae, Pleuronectidae, Liparidae, Oil exploration, Oil development, Petroleum resources.

Petroleum exploration and development is rapidly increasing throughout the nearshore areas of the Beaufort Sea. The objectives of this study were to determine the distribution and relative abundance of the various species of fish occupying the nearshore environs of the Beaufort Sea. Correlating important life history data with knowledge of habitat needs, it is hope that baseline information can be obtained to direct the activities of people and industry in the proposed lease area. It was found that species diversity within the study area is low. The anadromous species within the study area migrate and concentrate along the shallow, nearshore water of the mainland coast. The most frequently caught and wide ranging anadromous species are least cisco, Arctic cisco and Arctic char. Adult broad and humpback whitefish seldom range beyond the influence of the largest streams draining into the study area. And the presence of larval Arctic cod, capelin and fourhorn sculpins suggests that these species spawn in the coastal marine or estuarine waters of the study area. (Sinha-OEIS)
W77-01854

THE DISTRIBUTION, ABUNDANCE, DIVERSITY, AND PRODUCTIVITY OF BENTHIC ORGANISMS IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
H. M. Feder, G. Mueller, and S. Jewett.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 263-453, April 1976. 46 fig, 14 tab, 67 ref, append. 03-5-022-65.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Benthos, *Invertebrates, *Biomass, *Distribution patterns, *Demersal fish, Continental Shelf, Alaska.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Pacific cod, Gadus macrocephalus, Crabs, Chionoecetes bairdi, Species diversity, Diversity index, Oil exploration, Oil development, Petroleum resources.

Forty-two widely dispersed permanent stations were established in the northeastern Gulf of Alaska in conjunction with the physical, chemical, heavy metals and hydrocarbon programs. In general, high measures of evenness in the diversity indices show numerical codominance of many species (with low Simpson index and high Shannon and Brillouin indices) while low evenness measures imply marked dominance of a few species. Criteria established for Biologically Important Taxa (BIT) for the grab data have delineated 95 species. These species have been subjected to detailed analysis in an attempt to comprehend station species aggregations or communities. Preliminary analysis of the data indicates that the commercially important crab, Chionoecetes bairdi clearly dominates the invertebrate biomass. Further, stomach analysis of the Pacific cod Gadus macrocephalus on the Kodiak shelf area, reveals that C. bairdi is a dominant food item. Here we find a non-commercial species which has potential commercial importance, preying intensively on a species of great commercial significance. (Sinha-OEIS)
W77-01855

SUMMARIZATION OF EXISTING LITERATURE AND UNPUBLISHED DATA ON THE DISTRIBUTION, ABUNDANCE AND PRODUCTIVITY OF BENTHIC ORGANISMS OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
H. M. Feder.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 455-470, April 1976. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Benthos, *Bibliographies, Alaska, Continental shelf, Biology.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Bering Sea, Oil exploration, Oil development, Petroleum resources.

The existing literature on the systematics, abundance and feeding biology on the Gulf of Alaska and Bering Sea marine organisms is summarized. Unpublished data and archived biological samples available for analysis were located. This information should provide a historical perspective of the abundance and distribution of benthic animals and establish the current state of knowledge on the biology of these organisms. With this historical perspective current OCS projects looking at the current distribution and biology of marine organisms can be interpreted in a larger time frame. (Sinha-OEIS)
W77-01856

FOOD AND FEEDING RELATIONSHIPS IN THE BENTHIC AND DEMERSAL FISHES OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
R. L. Smith, A. C. Paulson, and J. R. Rose.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 471-508, April 1976. 4 fig, 3 tab, 77 ref. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Benthos, *Demersal fishes, *Food habits, *Commercial fishing, Continental Shelf, Alaska, Bibliographies.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Bering Sea, Oil development, Oil exploration, Feeding habits, Hippoglossoides, Hippoglossus, Lepidosetta, Sebastes, Glyptocephalus.

The ultimate goal is to construct a detailed picture of the food and feeding relationships of the fishes in the Gulf of Alaska and Bering Sea. This will include analyses of predator size vs. prey composition; bottom type, temperature and location vs. prey composition; prey composition in diets vs. prey abundance; prey composition vs. season. The rationale behind this study is to develop an ability to predict the impact of oil development activities on the fishes. This study, coupled with others designed to study acute and chronic toxic effects on the fish populations, will establish the predictive base necessary to make management decisions. (Sinha-OEIS)
W77-01857

PREPARATION OF ILLUSTRATED KEYS TO SKELETAL REMAINS AND OTOLITHS OF FORAGE FISHES - BERING SEA AND GULF OF ALASKA,
Alaska Univ., College.
J. E. Morrow.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 509-520, April 1976. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Forage fishes, Continental Shelf, Alaska.
Identifiers: *Outer Continental Shelf, Gulf of Alaska, Bering Sea, Faunal keys, Otoliths, Oil development, Oil exploration, Petroleum resources.

The objectives of this study are to prepare illustrated keys to skeletal remains and otoliths of forage fishes of the area. These will be used by investigators in other fields to determine the foods and trophic feeding levels of marine mammals, sea birds, and the larger demersal fishes. The implications with respect to OCS oil and gas development lie with these other studies rather than with this project. Skeletal material from 68 specimens of 35 species has been prepared and stored for future study. An additional 85 skeletons are in process. Otoliths have been obtained from 278 specimens representing 64 species in 16 families. Forty-six of these species were obtained from the 1975 trawling cruises, the remaining 18 from the University of Alaska Museum Fish Collection. On the basis of otoliths, working definitions of all 16 families have been prepared. A preliminary key to the families, genera and species is being prepared. (Sinha-OEIS)
W77-01858

PREPARATION OF ILLUSTRATED KEYS TO SKELETAL REMAINS AND OTOLITHS OF FORAGE FISHES - BEAUFORT SEA,
Alaska Univ., College.
J. E. Morrow.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 521-532, April 1976. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, Forage fish, Continental Shelf, Alaska.
Identifiers: *Outer Continental Shelf, Beaufort Sea, Faunal keys, Otoliths, Oil development, Oil exploration, Petroleum resources.

A fairly large number of papers has been published in which the otoliths of major taxonomic groups

have been broadly characterized. However, no detailed work exists by which the otoliths of particular species may be recognized. This is especially true of the fishes of the far north, which have been virtually unstudied from any aspect The Beaufort Sea material has been combined with specimens from the Bering Sea and Gulf of Alaska to prepare a key to otoliths. On the basis of this material families have been defined, and a preliminary key to the otoliths is being prepared. It is suggested that copies of this key be sent to other investigators dealing with food habits of marine mammals, sea birds and demersal fishes for testing and comparison. (Sinha-OEIS)
W77-01859

LITERATURE SEARCH ON THE DENSITY AND DISTRIBUTION OF FISHES OF THE BEAUFORT SEA,
Alaska Univ., College.
J. E. Morrow.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 533-541, April 1976. 03-5-022-56.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Bibliographies, *Fishes, Continental Shelf, Alaska.
Identifiers: *Outer Continental Shelf, Beaufort Sea, Oil exploration, Oil development, Petroleum resources.

The sole objective is to prepare an annotated bibliography on the density and distribution of the fishes of the Beaufort Sea. This bibliography will provide a data base for future research in the aquatic environment of the area. The Beaufort Sea is virtually unknown as far as fauna is concerned. Neither qualitative nor quantitative aspects have been determined. Data exist as published or unpublished papers and reports, ranging from the narratives of early polar explorers to modern, highly technical reports on narrow aspects of the ecological relationships in small parts of the sea. By bringing all this information together in one place, we will contribute to the ability of future workers to predict, ameliorate and even avoid altogether the adverse effects of petroleum exploration and production on the environment. Almost 1,000 items have been searched, annotated and entered on file cards. (Sinha-OEIS)
W77-01860

ALASKA MARINE ICHTHYOPLANKTON KEY,
Washington Univ., Seattle. Dept. of Oceanography.
T. S. English.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 543-578, April 1976. p 558-578. 03-5-022-67-TA9 No. 4.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Bibliographies, *Life history studies, *Fisheries, Continental Shelf, Alaska, Fish, Shellfish.
Identifiers: *Outer Continental Shelf, Ichthyoplankton key, Oil development, Oil exploration, Petroleum resources.

A preliminary key to the pelagic fish eggs of Alaskan waters has been constructed. The key is based on live material and covers 21 species of commercial or possible commercial value. Some species have been excluded because no information is available. A list has been prepared of commercially valuable Alaskan species, including 48 species of fish, 2 species of shrimps, 3 species of crabs, 3 species of clams, 1 species of scallop, and 1 species of abalone. A list of references for these species is included. A list has been prepared of Alaskan fishes with pelagic larvae. This list comprises 173 species from 37 families. A bibliography has been prepared covering life history information on 15 fish species of commercial value. There are approximately 100-130 references dealing with pelagic life history studies of Alaskan commercial species although many of these species are also found elsewhere. There is little available information concerning fishes in the Beaufort Sea. A bibliography of about 75 references to literature relating to ichthyoplankton and fisheries in Alaskan waters has been compiled. (Sinha-OEIS)
W77-01861

LITTORAL SURVEY OF THE BEAUFORT SEA,
Western Washington State Coll. Bellingham.
A. C. Broad.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 579-591, April 1976. 11 ref. 03-5-022-81.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Habitats, *Biota, *Aquatic animals, *Aquatic environment, Continental Shelf, Alaska, Arctic Sea, Crustaceans, Mollusks, Trophic levels, Amphipoda.
Identifiers: *Outer Continental Shelf, *Beaufort Sea, Littoral survey, Epifauna, Polychaetes, Oil development, Oil exploration, Petroleum resources.

This study is a survey of the edge of the Beaufort Sea designed to characterize habitats and ecological relationships of the Alaskan Arctic Ocean coastline between the U.S.-Canadian border (Demarcation Point) and Point Barrow sufficient to provide an immediate estimate of risks incurred in OCS oil and gas exploration and development and to furnish a base for planning further research. Analysis of samples taken during the summer of 1975 includes sorting biological specimens from the substrate material retained on sieves or in nets, identification or tentative identification of specimens, counts by species, wet weight determinations, and preservation for storage. In general, the density of polychaete populations is greater in samples from depths of two meters or more and all so far sorted include at least several worms. The indication currently is that distribution of infauna in the very shallow water is uneven and may be related to the presence of peat (disintegrating tundra vegetation) in the substrate. The principal epifaunal animals of the shallow Beaufort Sea are crustaceans and our data so far are in agreement with this finding of other investigators. The principal infaunal animals of the shallow Beaufort Sea are mollusks and polychaetes. (Sinha-OEIS)
W77-01862

BEAUFORT SEA PLANKTON STUDIES,
Washington Univ., Seattle. Dept. of Oceanography.
T. S. English, and R. A. Horner.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1976, Vol 7. Fish, Plankton, Benthos, Littoral, p 593-671, April 1976. 9 fig, 10 tab, 5 ref, append. 03-5-022-67-TA2, No 4.

Descriptors: *Resources development, *Environmental effects, *Baseline studies, *Cold regions, *Ecology, *Water pollution effects, *Oil pollution, *Phytoplankton, *Zooplankton, *Plankton, Continental Shelf, Alaska, Sea ice, Nitrates, Chlorophyll, Bibliographies.
Identifiers: *Outer Continental Shelf, *Oceanographic data, Beaufort Sea, Ice break up, Flora, Ichthyoplankton, Oil development, Oil exploration, Petroleum resources.

The two tasks of primary emphasis were to determine seasonal density distribution and environmental requirements of principal species of phytoplankton, zooplankton, and ichthyoplankton and to determine seasonal indices of phytoplankton production, including the sea ice flora. The task of secondary emphasis will be to summarize the existing literature, unpublished data, and archived samples. Chaetoceros furcellatus is usually considered to be a spring diatom. It occurs with spores in the Barrow area at the edge of the ice. The Thalassiosira species present are also spring forms. Many of the pennate diatoms, while not identified to species, appear to be diatoms that usually live in sea ice in spring. It appears that the phytoplankton community sampled in September 1975 consisted primarily of species characteristic of the spring bloom that usually occurs about the time the ice breaks up. The average nitrate plus nitrite concentration was about twice that of 1972 while ammonia was only slightly higher. This could indicate that the phytoplankton bloom was taking place during early September. The literature review for Beaufort Sea zooplankton and phytoplankton is continuing. Approximately 615 references pertinent to Arctic zooplankton have been obtained as well as approximately 125 Arctic phytoplankton references. (Sinha-OEIS)
W77-01863

THE PHYSIOLOGICAL EFFECT OF ACUTE AND CHRONIC EXPOSURE TO HYDROCARBONS OF PETROLEUM ON THE NEAR-SHORE FISHES OF THE BERING SEA,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5C.
W77-01864

PHYSIOLOGICAL IMPACT OF OIL ON PINNIPEDS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01865

ACUTE AND CHRONIC TOXICITY, UPTAKE AND DEPURATION, AND SUBLETHAL METABOLIC RESPONSE OF ALASKAN MARINE ORGANISMS TO PETROLEUM HYDROCARBONS,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.; and National Marine Fisheries Service, Seattle, Washington. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01866

RESPONSE OF THE CLAM, MACOMA BALTHICA (LINNAEUS), ESPOSED TO PRUDHOE BAY CRUDE OIL AS UNMIXED OIL, WATER-SOLUBLE FRACTION, AND SEDIMENT-ADSORBED FRACTION IN THE LABORATORY,
National Marine Fisheries Services, Auke Bay, Alaska. Auke Bay Lab.; and National Marine Fisheries Services, Seattle, Washington. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01867

EFFECT OF PETROLEUM HYDROCARBONS ON BREATHING AND COUGHING RATES, AND HYDROCARBON UPTAKE-DEPURATION IN PINK SALMON FRY,
National Marine Fisheries Service, Auke Bay, Alaska. Auke Bay Lab.; and National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01868

SUBLETHAL EFFECTS AS REFLECTED BY MORPHOLOGICAL, CHEMICAL, PHYSIOLOGICAL AND BEHAVIORAL INDICES,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01869

IDENTIFICATION OF MAJOR PROCESSES IN BIOTRANSFORMATIONS OF PETROLEUM HYDROCARBONS AND TRACE METALS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01870

ASSESSMENT OF AVAILABLE LITERATURE ON EFFECTS OF OIL POLLUTION ON BIOTA IN ARCTIC AND SUBARCTIC WATERS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-01871

ACUTE EFFECTS - PACIFIC HERRING ROE IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-01872

ACUTE AND CHRONIC TOXICITY OF SEAWATER EXTRACTS OF ALASKAN CRUDE OIL TO ZOEAE OF THE DUNGENESS CRAB, CANCER MAGISTER DANA,
Oregon State Univ., Newport. Marine Science Center.
For primary bibliographic entry see Field 5C.
W77-01873

SUBLETHAL EFFECTS - EFFECTS ON SEA GRASS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-01874

THE HYDROLOGY OF PREHISTORIC FARMING SYSTEMS IN A CENTRAL ARIZONA ECOTONE,
Southern Illinois Univ., Carbondale.
For primary bibliographic entry see Field 3F.
W77-01891

A TRAGEDY OF THE COMMONS IN THE SAHEL,
Massachusetts Inst. of Tech., Cambridge.
A. C. Picardi, and W. W. Seifert.
Technology Review, Vol. 78, No. 6., p 42-51, May, 1976. 3 fig, 4 tab, 7 ref.

Descriptors: *Deserts, *Computer models, *Range management, *Water shortage, *Arid lands, Ranges, Browse utilization, *Grazing, Rain, Rainfall, Precipitation(Atmospheric), Africa, Droughts, Water utilization, Pastures, Soil erosion, Social aspects, Cattle, Conservation, Africa.
Identifiers: *Desertification, *Commons concept, *Sahel, *Overgrazing.

According to the commons concept, when commonly held resources are exploited according to individual self interest, the resources will be overexploited and destroyed by the same people who benefit from them. The application of the commons concept in the Sahel area of Africa is discussed. Research was conducted and data collected to create a computer simulation model relating the interactions among the ecosystem, livestock herds and the human population. The purpose of the model was to test longterm policies for the recovery and restoration of the Sahel areas so that AID organizations might work effectively to help the region's recovery and development. The utilization of water, the overgrazing of cattle and resulting desertification are discussed and conclusions presented. The model shows that herdsmen who graze cattle on the Sahel will continue to have the same priority of self interest, resulting in overgrazing of the range. For conservation of rangeland, a change in cultural priorities is necessary. (Jamail-Arizona)
W77-01908

WATER QUALITY ANALYSIS, UPPER MISSISSIPPI RIVER BASIN.
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W77-01953

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, COLUMBIA RIVER.
Parametrix, Inc., Seattle, Wash.
For primary bibliographic entry see Field 5G.
W77-01955

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, UPPER RIO GRANDE,
Academy of Natural Sciences of Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W77-01956

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, HOUSATONIC RIVER,
Lawler, Matusky and Skelly Engineers, Tappan, N. Y.
For primary bibliographic entry see Field 5G.
W77-01957

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, ESCAMBIA RIVER AND BAY,
Atlantis Scientific, Tallahassee, Fla.
For primary bibliographic entry see Field 5G.
W77-01961

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, GUADALUPE-SAN ANTONIO RIVER BASIN,
Water Resource Engineers, Inc., Austin, Tex.
For primary bibliographic entry see Field 5G.
W77-01962

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, ST. JOHN RIVER ESTUARY (FLORIDA),
Atlantis Scientific, Tallahassee, Fla.
For primary bibliographic entry see Field 5G.
W77-01964

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, GULF OF ALASKA.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01966

WATER QUALITY ANALYSIS, THE POTOMAC RIVER.
GKY and Associates, Alexandria, Va.
For primary bibliographic entry see Field 5G.
W77-01968

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, S. CALIFORNIA BIGHT.
Tetra Tech, Inc., Pasadena, California.
For primary bibliographic entry see Field 5G.
W77-01969

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, HAWAII.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01970

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, PUERTO RICO.
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01971

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, SOUTH PLATTE.
Tetra-Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 5G.
W77-01972

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, SUSQUEHANNA RIVER.
Lawler, Matusky and Skelly Engineers, Tappan, N. Y.
For primary bibliographic entry see Field 5G.
W77-01973

WATER POLLUTION CONTROL ACT OF 1972, ENVIRONMENTAL IMPACT ASSESSMENT, SANTEE RIVER BASIN.
Academy of Natural Sciences of Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W77-01976

ENVIRONMENTAL IMPACT ASSESSMENT, WATER QUALITY ANALYSIS, ST. JOHN RIVER (MAINE).
Meta Systems, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W77-01977

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, DELAWARE RIVER BASIN, (PARTS 1, 2, AND 3).
Betz Environmental Engineers, Inc., Plymouth Meeting, Pa.
For primary bibliographic entry see Field 5G.
W77-01978

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, GREAT LAKES-LAKE ERIE, (VOLUMES 1, 2, AND 3).
Dalton-Dalton-Little-Newport, Inc., Cleveland, Ohio.
For primary bibliographic entry see Field 5G.
W77-01979

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, CHATTAHOOCHEE-FLINT-APALACHICOLA, (PARTS 1 AND 2).
Hammer, Siler, George Associates, Atlanta, Ga.
For primary bibliographic entry see Field 5G.
W77-01980

WATER POLLUTION CONTROL ACT OF 1972, REGIONAL IMPACTS, OHIO RIVER BASIN, (VOLUMES 1 AND 2).
Dames and Moore, Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W77-01981

FUTURE ENVIRONMENTAL NEEDS AND COSTS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.

S. F. Singer.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 7-31 and 279-282. 3 fig., 1 tab., 3 ref. NO1-HD-22052.

Descriptors: *Pollution abatement, *Welfare(Economics), *Economic impact, *Costs, Economic efficiency, Cost-benefit analysis, Equitable apportionment, Gross National Product, Marginal costs, Marginal benefits, Cost allocation.
Identifiers: Environmental quality costs, Demography.

The question of how to strike a balance between spending funds for a clean environment and spending funds for other things that contribute to the welfare of people is approached. Although theoretical approaches such as benefit-cost analysis are available for such evaluations, often the costs can not be measured very well, and the benefits are difficult to define. Also dealt with are the questions of achieving the chosen level of environmental quality in the most efficient way, and of maintaining equity in the system as each gradient of the clean environment is achieved. The most important determinant for environmental quality expenditures is the level of environmental quality desired. Ideally this would be set where the marginal benefits and marginal costs of investment are equal, however a fluctuation around the ideal is more realistic given political considerations. Costs of pollution should always be added to the cost of manufacture if the polluter is an industrialist, resulting in the passing of the cost on to the purchaser of the product. In order to better understand the effects of growth specifically on environmental quality and generally on societal welfare, a single index incorporating population, resources, environment, and GNP is developed. A model of pollution control costs is appended. (Becker-Wisconsin)
W77-02044

EFFECTS OF POLLUTION ON HUMAN HEALTH,
Environmental Protection Agency, Chapel Hill, N.C. Clinical Studies Branch.
N. Rummo.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 33-73. 21 tab.

Descriptors: *Air pollution effects, *Public health, *Pollution abatement, *Standards, Pollutants, Costs, Control, Estimating, Risks, Safety, Measurement, Approximation method.

The Clean Air Act of 1970, which promulgated standards for six air pollutants (sulphur dioxide, carbon monoxide, oxident levels, oxides of nitrogen, particulates, and hydrocarbons) assumes that there exists a morbidity threshold for each pollutant and for every adverse health effect. This is questionable. The Clean Air Act requires that standards be set to protect the public health and that these standards contain an adequate margin of safety. Adverse effects include both the aggravation of existing diseases and an increased frequency of health disorders. There are difficulties determining what changes in body functions are responsive to a particular pollutant. Also difficult is the determination of harm from pollutants to groups that are particularly susceptible, such as persons with certain diseases, infants and unborn fetuses and embryos. Air pollutants, either separately or in combination with other pollutants, may increase the risk in the general population for the development of certain disorders. Although the severity of the effects of individual pollutants is understood, the scientific information on which the air quality standards is based has major gaps. Most adverse health effects are best evaluated by blending the complementary research approaches of epidemiology, clinical research, and animal toxicology. (Becker-Wisconsin)
W77-02045

ENVIRONMENTAL POLLUTION CONTROL AND HEALTH BENEFITS,
Washington Environmental Research Center, D. C. Economic Analysis Branch.
T. E. Waddell.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 75-91. 6 ref.

Descriptors: *Benefits, *Public health, *Morbidity, *Mortality, *Air pollution effects, Economic efficiency, Equity, Costs.

To economists, problems resulting from environmental pollution are due to the inability of the market place to allocate resources. For informed and economically efficient and equitable management decisions to be made (instead of relying on the marketplace) adequate information must be provided for the decision-maker, including (1) cost of control, (2) benefits of control, (3) who pays, and (4) who benefits. Of the total calculus of benefits from the abatement of air pollution, certainly in the short run, those to human health rank in the highest priority, but are not easily measured. To economists, the conceptually correct notion of health benefits is the willingness to pay for improved health; but since it is difficult to elicit such measures directly, proxies are used. Several methods of approximating the benefits to human health from air pollution abatement are included. The loss of output and cost of medical care approach is discussed in terms of both morbidity and mortality. The questions of valuing time empirically is also approached. The best estimate of cost savings to human health in 1970 for both mortality and morbidity is estimated between $1.6 billion to $7.6 billion for suspended particulates, suspended sulfates and sulfur oxides reduced to primary standards. (Becker-Wisconsin)
W77-02046

ECONOMICS OF ENVIRONMENTAL CONTROL POLICIES,
Atomic Energy Commission, Washington, D. C. Bureau of Licensing.
J. F. O'Leary.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 95-115.

Descriptors: *Decision making, *Cost-benefit analysis, *Nuclear powerplants, *Standards, Pollution abatement, Radioactivity, Economic impact, Sites, Risks, Fisheries, Fossil fuels, Measurement, Attitudes.
Identifiers: *Risk-benefit tradeoffs.

To a degree, environmental standards are a product of health and economic concerns, but to a substantial degree they are also a product of feelings for the fitness of things--things that are really not quantifiable. Informed judgment, rather than strictly applied analytical tools, have to be relied on as the arbiter of how to go about handling environmental problems; however, it is important to develop the physical and economic measurements so that analytical tools can be objectively applied in the future. The role of the Atomic Energy Commission in the advancement of the art of benefit-cost analysis is illustrated. The AEC adopted the as-low-as-possible (ALAP) approach towards radiological emissions, without being explicit as to the economic parameters of the practicable, and through the application of the ALAP doctrine, brought the controversy about nuclear plant-sitings under control. A question and answer period following the paper presentation initiated discussion of topics varying from specific problems to international emissions standards and methodology. Underground nuclear facilities siting, the value of fisheries vs. nuclear facililities and fossil fuel energy versus nuclear energy were some of the topics. Cost-benefit analysis is discussed in terms of being the best available technique, but still lacking precision. (Becker-Wisconsin)
W77-02047

INTRODUCTORY REMARKS ON ENVIRONMENTAL CONTROL STRATEGIES,
Mitre Corp., McLean, Va.
R. S. Greeley.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 117-128.

Descriptors: *Pollution abatement, *Costs, *Economic impact, *Standards, Water pollution control, Air pollution, Economic efficiency, Energy, Sulfur, Waste treatment, Domestic wastes, Industrial wastes, Toxins, Mining, Equity, State governments.
Identifiers: *Selective pollution control.

The United States could do much better in the area of environmental control strategies from a cost effective standpoint by developing and adopting regulations at a local level. The total anti-pollution cost over the next decade is estimated by the Council on Environmental Quality to be $275 billion, some of which are unnecessary costs. Five problem areas in environmental control which take present legislation into account and give cost-effective long run results are discussed: (1) stationary sources of air pollution, (2) mobile sources of air pollution, (3) water pollution, (4) toxic substances, and (5) resource extraction. With shortages of low sulfur fossil fuels and increases in waste discharges into water, state regulations for control of both air and water pollution were drawn up without regard to the relative contributions of polluters. Equity and uniformity were emphasized at the cost of economic inefficiency. In the toxic substances and resource extraction areas both the economic considerations behind legislation and the long term ecological and health effects need to be examined more closely. New concepts, both institutional and cultural, are needed as goals for environmental control strategies. A better cost-effective point can be reached despite increased administrative costs and equity problems. (Becker-Wisconsin)
W77-02048

ENVIRONMENTALIST VIEW OF 'NONDEGRADATION,' 'BEST PRACTICABLE TECHNOLOGY' AND 'BEST AVAILABLE TECHNOLOGY',
Sierra Club, Washington, D. C.
L. I. Moss.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 129-168. 3 tab., 11 ref.

Descriptors: *Air pollution, *Energy, *Clean Air Act, *Pollution abatement, Technology, Electric power production, Pricing.
Identifiers: *Sierra Club, *Air quality standards, Best practicable technology, Best available technology, Alternate energy sources, Energy pricing.

A great deal of reform is needed in terms of the economies and pricing of energy. By not subsidizing energy intensive activities, capital is freed which can then be allocated to investments with higher intrinsic rates of return. In the gas and electricity industries, all users ought to pay at a level which is enough to cover the cost of developing new or replacement supplies. With regard to air quality standards, the Sierra Club law suit against the Administrator of EPA emphasized the long run inadequacies of the Clean Air Act of 1970. A seven

point plan proposed to prevent significant deterioration of air quality includes national limits on allowable increases in ambient concentrations and an open process for public comments on applications for permits. On the issues of best practicable and best available technology, the question of whether to substitute a new technology rather than to rescue the existing technology is discussed. Economic incentives do not presently exist for polluters to rapidly develop and implement technology. Also included are a question and answer session during which alternate energy sources were discussed, and the Sierra Club testimony given at EPA hearings (August, 1973) on 'Significant Deterioration.' (Becker-Wisconsin)
W77-02049

INDUSTRIALIST VIEW,
Chamber of Commerce of the United States, Washington, D. C.
J. Coffey.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 169-186.

Descriptors: *Pollution abatement, *Industrial production, *Economic impact, *Social impact, Clean Air Act, Federal Water Pollution Control Act, Land use, Standards, Cities, Legislation, Government supports, Pollution taxes(Charges).
Identifiers: *Economic growth.

Pollution abatement legislation is affecting the future of economic growth in the United States. The environmental policy emphasizes the impact of certain human activities on portions of the physical environment and almost ignores any social and economic impact. There are three major elements, the Clean Air Act, the Water Pollution Control Act, and proposed Land Use legislation, that contribute to this policy. Social and economic impacts in the implementation of primary and secondary air quality standards are discussed. The nondegradation policy of EPA will tend to concentrate population and industry in areas already under substantial environmental pressure. The location of new facilities of any kind is a difficult problem given constraint by the Clean Air and the Federal Water Pollution Control Acts. Land use legislation and its long term ramifications is related to industrial planning, and private property rights. The concept of non-degradation is developed as it relates to the full quality of life as opposed to just one aspect of the physical environment. It is suggested that laws and regulations will be more workable only after the public becomes aware of how costly and in some respects how redundant, in terms of health and the physical environment, they are. (Becker-Wisconsin)
W77-02050

GOVERNMENT VIEW,
D. D. Dominick.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 187-221.

Descriptors: *Decision making, *Pollution abatement, *Air pollution, *Standards, Clean Air Act, Social impact, Legislation, Transportation, Industrial production, Economic impact, Land use.
Identifiers: *Ambient air quality, EPA, Sierra Club, Clean airsheds, Zero pollution.

The EPA has taken a position to take into account unintended and undesireable consequences of Congressional legislation in the regulations it has to enforce. The case of Sierra Club vs. Ruckelshaus is used to illustrate principles and problems facing decision-makers in the field of environmental regulation. In response to the 1970 Clean Air Act many institutions, public and private, interacted in a process to determine the 'public interest' before the matter was remanded to EPA with the prevention of significant air quality deterioration as the goal. The logic used to determine the administrative definition of 'significant air quality deterioration' is discussed. Explicit arguments used by EPA for their reluctance to implement a strict nondegradation policy in air quality included: (1) the courts did not define the term 'significant deterioration', (2) nationwide air quality is improving considerably, and (3) the measures necessary to prevent all deterioration would bring growth and development to a virtual standstill. Speculation on implied and unstated reasons for EPA policy-makers' reluctance for a strict policy included such ideas as: (1) it could be tantamount to prohibiting new growth or new activities anywhere, and (2) it could put EPA's future as a social force on trial. (Becker-Wisconsin).
W77-02051

PANEL 'A' - AUTOMOTIVE EMISSIONS,
L. A. Goldmuntz.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 225-230 and 283-312. 1 fig, 3 tab.

Descriptors: *Air pollution, *Pollution abatement, *Standards, *Economic efficiency, Conferences, Clean Air Act, Safety, Oxides, Catalysts, Cities, Rural areas, Pollutants, Suspended solids, Sulfur compounds.
Identifiers: *Automotive emissions, Carbon monoxide, Nitrous oxides, Hydrocarbons, Sulfur dioxide, Particulates.

The automotive emissions regulations were discussed to determine the cost effectiveness of the strategy as related to standards for carbon monoxide, nitrous oxides, and oxidants; the safety factors where health related effects are first detected; and the allowable standards to meet ambient levels taking into account other source contributions. Also discussed were the automotive technology applicable to various emission standards, the capital costs and fuel costs associated with each technology, the probability of an octane war, and the improved cost effectiveness that would derive from granting the EPA flexibility to set the time for compliance as a function of a given region's problem, topography and population density. There was substantial disagreement between EPA and industry on how automotive emissions should be related to ambient standards although concurrence was reached that carbon monoxide levels could be satisfied by 1980 utilizing a standard of 20 g/mile. Levels (per mile) of 1-1.5 for hydrocarbons, 20-25 for carbon monoxide, 3-3.5 for nitrous oxides can be met by spark timing, mixture adjustments, manifold reactors or leaded fuel and high compression engines at costs less than $100 to the consumer. Certain stricter standards can be met by an exhaust catalyst at a $250 cost. An emission standard for California, utilizing the catalyst, and one for the remainder of the country, using engine fixes would be acceptable to the industry. (Auen-Wisconsin)
W77-02052

AGRICULTURAL AND OTHER NON-POINT SOURCES OF WATER POLLUTION,
Interstate Commission on the Potomac River Basin, Bethesda, Md.
For primary bibliographic entry see Field 5G.
W77-02053

PANEL 'C' - TOXIC SUBSTANCES,
Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.
G. E. Schweitzer.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 231-241 and 313-330.

Descriptors: *Economic impact, *Chemicals, *Regulation, *Public health, *Cost-benefit analysis, Pollution abatement, Welfare(Economics), Decision making, Toxicity, Social impact, Risks, Pollutants.
Identifiers: *Risk-benefit trade-offs.

This panel's discussion considered the complexities involved in limiting or prohibiting usage of chemicals of defined deleterious effects or those posing synergistic or unknown health hazards and the problems inherent inherent in the evaluation of the risk vs. economic benefits in prescribing standards. Among the examples of risk-benefit tradeoffs cited are the bans on DES as a cattle feed additive, on DDT in relation to the tussock moth infestations, on leaded gasoline, cadmium, PCBs, cyanide, asbestos, and beryllium and the consequent impact on manufacturing processes and long range economic effects. Questions were posed regarding the identification of a threshold effect on health, if assumptions can be made whether substances have or have not a threshold, and what decisions are involved when thresholds are below detection levels; and the aspects of delayed, irreversible and reversible effects in relation to risk-benefit evaluation. Other areas addressed were: how much cost should be incurred from regulation; how much effort should be expended in determining what commercial substances are toxic; which should be tested in view that substances change with the introduction of new products; and how to relate the expense of tests to avoid restriction of new products and stifling industrial research. The presumption is that risk-benefit approaches will be acceptable within a decade depending on their socio-economic utility. (Auen-Wisconsin)
W77-02054

PANEL 'D' - POWER PLANT AND INDUSTRIAL EMISSIONS AND EFFLUENTS,
Mitre Corp., McLean, Va.
R. S. Greeley.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 257-268 and 343-360.

Descriptors: *Pollution abatement, *Standards, *Powerplants, *Industries, Air pollution, Water pollution, Social aspects, Economic impact, Cost-benefit analysis, Capital investment, Technology, Regional analysis, Alternative planning, Public health, Tennessee Valley Authority, Economic efficiency, Energy, Water quality standards.
Identifiers: Effluent standards, Emission standards, Emission standards, Ambient standards.

The discussion centered on health effects of pollutants, control technology, impact of controls on energy and materials consumption, and cost-benefit and cost effective approaches. Cost-benefit analysis of pollution standards should embrace the societal risk even though comprehensive data on health effects of pollutants may be unavailable and that no satisfactory method of accounting for these has been devised. It was emphasized that those population segments which bear the costs and which receive the benefits should be identified and incorporated in cost-benefit analyses. Viewpoints were expressed on resolution of pollution control problems based on a fundamental and totally integrated approach, a genuine corporate commitment, a federal R and D program, a need for defining the elements of cost and benefits in a total sense, and the cost effectiveness in terms of risk reduction afforded and a more precise definition of that concept. A TVA representative described the strategy employed by them in emission controls, particularly in relation to sulfur oxides, followed by a discussion concerning the global dispersion of sulfur oxides. It was agreed that the current procedures of standard-setting fail to consider both the characteristics and location of the emitter, and that these factors are critical in effective control measures. The question

of 'effluent/emission guidelines' and 'air/water quality standards' was discussed as exemplified by the TVA control methods. (Auen-Wisconsin)
W77-02055

PANEL 'E' - RESOURCE EXTRACTION,
Geological Survey, Reston, Va. National Center.
H. Risser,
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p. 269-275 and 361-381.

Descriptors: *Mining, *Environmental effects, *Environmental control, *Economic justification, Strip mines, Oil industry, Natural gas, Continental Shelf, Acid mine water, Oil shales, Legislation, Land reclamation, Pollution taxes(Charges), Offshore platforms, Oil spills, Road construction, Land subsidence, Earthquakes, Water demand, Colorado River.
Identifiers: Geothermal energy.

The discussion centered on the environmental impact and economic efficiency of surface and underground coal mining, offshore oil and gas operations, geothermal power, and oil shale development. Land reclamation costs induced by surface mining depend on the site and the extent of reclamation required. The economic impact would depend on whether the costs can be passed on to the consumer. Outer Continental Shelf operations would involve construction of offshore facilities and minor and major oil spills. Clean up costs of spills can run into millions of dollars and economic losses suffered by tourism and fishermen because of oil polluted beaches and contaminated fish can be substantial. Underground coal mining has a lesser initial environmental impact but it generates surface subsidence and acid water discharges for many years. Treatment costs vary and precautionary measures can be taken. Geothermal power extraction has the potential for disrupting closed areas by operational facilities, land subsidence, stream pollution, increased microseismic activity and well blowouts. Geothermal dry steam can generate electricity more economically than conventional fuels but it would provide no more than 2% of the total U.S. energy required in the year 2000. Oil shale development would entail huge quantities of waste and require large quantities of water both for processing and waste disposal. (Auen-Wisconsin)
W77-02056

AGRICULTURAL AND OTHER NON-POINT SOURCES OF WATER POLLUTION: NON-POINT SOURCES AND COST EFFECTIVENESS,
Enviro-Control, Inc., Rockville, Md.
For primary bibliographic entry see Field 5G.
W77-02057

THE EFFECTS OF WATER POLLUTION FROM NON-POINT SOURCES AS IT RELATES TO THE HEALTH OF MAN,
Health Science Associates, Inc., Bethesda, Md.
For primary bibliographic entry see Field 5G.
W77-02058

CONTROL OF AMBIENT SO2 CONCENTRATIONS BY NONCONTINUOUS EMISSION LIMITATION LARGE COAL-FIRED POWER PLANTS,
Tennessee Valley Authority, Muscle Shoals, Ala. Air Quality Branch.
T. L. Monthomery, J. M. Leavitt, T. L. Crawford, and F. E. Gartrell.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p 427-454. 7 fig, 3 tab, 5 ref.

Descriptors: *Powerplants, *Air pollution, *Pollution abatement, *Weather patterns, Tennessee Valley Authority, Dispersion, Kentucky, Alabama, Tennessee.
Identifiers: *Sulfur dioxide.

The Tennessee Valley Authority's experience in reducing emissions of sulfur dioxide from its fossil fueled power plants demonstrates the practicality of reducing the generating loads during adverse meteorological conditions when emissions would exceed ambient standards. The program included investigations into the plume dispersions and evolution of mathematical models for estimating maximum ground-level concentrations of sulfur dioxide and the location of associated impact areas at each of the power plants. Emission limitations are achieved by plant generating load reductions during adverse plume dispersion periods as identified by on-site meteorological measurements. Since the beginning of the sulfur dioxide emission limitation program in September 1969 and continuing for 39 months, there have been 106 days when the meteorological conditions would have required some emission limitation if the plants had been operating at or near full capacity. However, due to unit outage or below full-load operation, there were only 41 days when the generating load had to be reduced. The magnitude of the load reductions ranged from 26 to 960 MW with an average of 454 MW. The average load reductions average 3.6 hours. The program has proved to be very effective in meeting state ambient air quality standards. (Auen-Wisconsin)
W77-02059

THE SAGA OF THE ENVIRONMENTAL STANDARD,
Mitre Corp., McLean, Va.
R. P. Ouellette.
In: Symposium proceedings 'Economics of a Clean Environment', January 14-16, 1974, Mitre Corporation, McLean, Virginia (Report M-74-24, July 1974), p 455-460.

Descriptors: *Decision making, *Air pollution, *Standards, Pollution abatement.
Identifiers: *Emission standards, *Ambient standards.

The choice of threshold air emission standards in relation to health based on emplitude stresses but ignoring the rate-dependent, rate-sensitive, rate limited, symbiotic and other uncontrollable covariants is questioned. In setting standards for the small quantities of 'hazardous substances' it is suggested that because many of these compounds are of similar chemical classes and originate from a limited number of sources in defined geographical areas, with similar behavior and pathways in the environment, combined standards could be set for those pollutants. While ambient standards are more acceptable than emission standards based on 'best available technology' they limit the industrial flexibility in control and as goals are not enforceable; therefore both ambient and emission standards may be needed. Another problem to be addressed is the priorities given to setting standards--which compounds should have a standard and in what order they should be set, given time, monies, and knowledge constraints. Also should dispersive quantity alone be a guide or should stability of the compound, movement in the environment, hazards, and potential for bioconcentration be taken into consideration. While standards have been viewed in the context of risk, cost and benefit tradeoff, a more efficient standard would be that which is set at a point where the marginal cost of control is equal to the marginal benefit. (Auen-Wisconsin)
W77-02060

NATIONAL EFFLUENT STANDARDS,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-02061

SUBSTANTIVE RIGHTS UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT,
Syracuse Univ., N.Y. Dept. of Law and Public Policy.
For primary bibliographic entry see Field 6E.
W77-02067

7. RESOURCES DATA

7A. Network Design

DESIGN OF SURFACE WATER DATA NETWORKS FOR REGIONAL INFORMATION,
Geological Survey, Reston, Va.
M. E. Moss.
Hydrological Sciences--Bulletin, Vol. 21, No. 1, p 113-127, March 1976. 2 fig, 3 tab, 11 ref. (Paper from Symposium and Workshops--Bratislava, September 1975: Application of Mathematical Models in Hydrology and Water Resources Systems).

Descriptors: *Surface waters, *Hydrologic data, *Networks, *Design, Regression analysis, Simulation analysis, Optimization, Streamflow, *Methodology, Economics, Equations, Mathematical models, Systems analysis, Regional analysis.
Identifiers: Gauging stations, Cost minimization.

The concept of equivalent years of record, a measure of parameter accuracy, in conjunction with regression analysis simulation leads to a methodology for specifying sets of numbers of gauging stations and lengths of record required to attain a prespecified level of regional streamflow-parameter accuracy. This methodology can be used in network design to identify the number of stations and length of record that is the least cost network that meets the accuracy criteria. The methodology also indicates situations in which the criteria cannot be met without improving the underlying regionalization model. (Bell-Cornell)
W77-01885

7B. Data Acquisition

LONG-RANGE ECHO SOUNDING WITH A CHIRP SOURCE,
Woods Hole Oceanographic Institution, Mass. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 2L.
W77-01614

SOIL WATER CONTENT AND EVAPORATION DETERMINED BY THERMAL PARAMETERS OBTAINED FROM GROUND-BASED AND REMOTE MEASUREMENTS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W77-01618

ON POLARIZATION FEATURES OF RADIO SIGNALS SCATTERED FROM THE SEA SURFACE AT SMALL GRAZING ANGLES,
Akademiya Nauk URSR, Kharkov. Inst. of Radio-Physics and Electronics.
For primary bibliographic entry see Field 2L.
W77-01620

FIELD MAPPING SOIL CONDUCTIVITY TO DELINEATE DRYLAND SALINE SEEPS WITH FOUR-ELECTRODE TECHNIQUE,
Agricultural Research Service, Sidney, Mont.
For primary bibliographic entry see Field 2G.
W77-01622

GRAVITATIONAL CIRCULATION IN LONG ISLAND SOUND,
State Univ. of New York at Stony Brook, Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W77-01634

BOUNDARY-LAYER TRAJECTORY ESTIMATES COMPARED WITH CONSTANT-VOLUME BALLOON TRAJECTORIES IN THE GREAT PLAINS,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Lab.
For primary bibliographic entry see Field 2B.
W77-01701

SUMMERTIME RADAR ECHO DISTRIBUTIONS OF MOIST CONVECTION OVER SOUTHERN NEVADA AND ADJACENT AREAS FOR 1971 AND 1972,
National Oceanic and Atmospheric Administration, Las Vegas, Nev. Air Resources Lab.
For primary bibliographic entry see Field 2B.
W77-01702

AN AID TO AGRICULTURAL DEW FORECASTING,
National Weather Service, Fort Worth, Tex. Southern Region.
For primary bibliographic entry see Field 2B.
W77-01704

METHOD FOR MEASURING VELOCITY AND DIRECTION OF CURRENTS IN A BODY OF WATER,
Office of the Secretary (Navy), Washington, D. C. (Assignee).
W. S. Richardson.
U. S. Patent No. 3,972,231, 8 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 65, August 3, 1976.

Descriptors: *Patents, *Water circulation, *Ocean circulation, *Currents(Water), *Velocity, Movement, Instrumentation, *Measurement, Dye dispersion, Marking techniques.
Identifiers: Direction.

A method for measuring velocity and direction of currents in bodies of water, such as an ocean, and more particularly to a method for making and recording a number of readings of current velocity and direction at various depths is disclosed. A first vehicle travels through water leaving a trail of dye and after a time delay, a second vehicle travels the same path as the first vehicle and measures the distance from the second vehicle to the dye path. The first and second vehicles are connected together, weighted, and dropped to the ocean bottom. Upon contact with the bottom, the first vehicle is released and rises to the surface under its own buoyancy. During ascent, a concentrated trail of fluorescein dye is released. After preselected time delay at the bottom, the second vehicle is released and rises to the surface. The second vehicle is provided with a recording optical rangefinder which measures the distance and direction to the trail of fluorescein dye left by the first vehicle. Each recording of the direction and distance to the dye trail gives a current vector at that depth and an essentially continuous profile of current speed and direction with depth is achieved. In another embodiment of the invention, a weighted vehicle is released from the surface and free-falls to the ocean bottom and after a specific delay a second vehicle is released over substantially the same path as the first vehicle. (Sinha-OEIS)
W77-01713

LOW LEVEL SNOW PRECIPITATION GAUGE,
Idaho Industrial Instruments, Inc., Boise, (Assignee).
For primary bibliographic entry see Field 2C.
W77-01744

WATER WHEEL ALL SEASON RAIN GAGE,
J. B. Davis.
U.S. Patent No. 3,978,723, 6 p, 8 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 950, no 1, p 77, September 7, 1976.

Descriptors: *Patents, *Rain, *Rain water, *Rain gages, Rainfall, *Instrumentation, Precipitation(Atmospheric), Water wheels, *Measurement.

An improved rain gage is described which uses a small precision made water wheel that moves constantly during rainfall in a variation of movement of light to heavy rainfall. The shaft of the water wheel drives three dials of 0 to 1, 1 to 10, 10 to 100 inches, using a knocker system without resetting the dials. All moving parts are water lubricated the moment of the first moisture to fall. The gage has a trough having an inlet for collecting rain and an outlet for discharging it. (Sinha-OEIS)
W77-01753

MONITORING GROUNDWATER QUALITY: MONITORING METHODOLOGY,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01775

NATIONAL EUTROPHICATION SURVEY METHODS 1973-1976.
National Environmental Research Center, Las Vegas, Nev. Monitoring Applications Lab.
For primary bibliographic entry see Field 5A.
W77-01787

THE HYDROLOGY OF PREHISTORIC FARMING SYSTEMS IN A CENTRAL ARIZONA ECOTONE,
Southern Illinois Univ., Carbondale.
For primary bibliographic entry see Field 3F.
W77-01891

USE OF CONSTANT LEVEL JAIN EVAPORIMETER IN SCHEDULING IRRIGATION,
Udaipur Univ. (India). Dept. of Agronomy.
For primary bibliographic entry see Field 2D.
W77-01907

POTENTIAL USE OF SATELLITE IR DATA FOR ICE THICKNESS MAPPING,
Development and Resources Transportation Co., Silver Spring, Md.
For primary bibliographic entry see Field 2C.
W77-01913

SOIL MOISTURE SURVEY EXPERIMENT AT PHOENIX, ARIZONA,
EG and G, Inc., Las Vegas, Nev. Las Vegas Area Operations.
For primary bibliographic entry see Field 2G.
W77-01914

ON THE POSSIBLE DETECTION OF TSUNAMIS BY A MONITORING OF THE IONOSPHERE,
Cooperative Inst. for Research in Environmental Science, Boulder, Colo.
For primary bibliographic entry see Field 2L.
W77-01918

CALCIUM CARBONATE DISTRIBUTION IN THE SURFACE SEDIMENTS OF THE INDIAN OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2L.
W77-01919

WAVE PATTERNS ACROSS THE NORTH ATLANTIC ON SEPTEMBER 28, 1974, FROM AIRBORNE RADAR IMAGERY,
Jet Propulsion Lab., Pasadena, Calif.
For primary bibliographic entry see Field 2L.
W77-01921

RADAR IMAGING OF OCEAN SURFACE PATTERNS,
Jet Propulsion Lab., Pasadena, Calif.
For primary bibliographic entry see Field 2L.
W77-01932

FLASH FLOODS.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 2E.
W77-01933

HYDRAULIC PERFORMANCE OF FLUMES FOR MEASUREMENT OF SEDIMENT-LADEN FLASH FLOODS,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2E.
W77-01935

FIELD MONITORING EQUIPMENT FOR HYDROLOGICAL STUDIES IN A SMALL CATCHMENT,
Bristol Univ. (England). Dept. of Civil Engineering.
T. L. Shaw, R. J. Marshall, H. S. Wheater, and N. P. Markovits.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 29-33, 1974. 2 fig, 3 ref.

Descriptors: *Small watersheds, *Monitoring, *Hydrologic data, *Instrumentation, Equipment, Networks, Rain gages, Rainfall, Measurement, Soil moisture, Streamflow, On-site investigations, Data processing.

This paper reviewed the design and operation of a network of field instruments that continuously measure rainfall and streamflow. The instruments collect information and process it for storage on magnetic tape. Details were given of all the stages of data collection and the precautions that must be taken. (See also W77-01933) (Humphreys-ISWS)
W77-01936

DISASTERS CAUSED BY FLASH FLOODS,
National Research Center for Disaster Prevention, Tokyo (Japan).
For primary bibliographic entry see Field 2E.
W77-01937

OPERATIONAL ARRANGEMENT OF RAIN-GAUGE STATIONS IN FORECASTING FLASH FLOODS,
Kyoto Univ. (Japan).
For primary bibliographic entry see Field 4A.
W77-01938

WARNING SYSTEM FOR SEVERE FLOODS,
Water Survey of Canada, Calgary (Alberta).
W. Nemanishen.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 81-86, 1974. 4 fig.

Descriptors: *Warning systems, *Flash floods, *Canada, *Flood forecasting, Floods, Remote sensing, River forecasting, Hydrology, Networks.

Two requirements for combatting severe flash floods are preparation and alertness. Suggested

advance preparations include pre-flood field and office organization. Pre-flood field preparations may require several years to complete if they include: (1) cross sections drawn from all strategic highway and railway bridges, (2) some current-meter measurement made at these sites to define a rough elevation-discharge relationship, (3) permanent benchmarks established at each bridge and the elevation of several prominent bridge members (e.g., guard rails, tracks) determined, (4) several small index basins instrumented to monitor runoff, and (5) reporting and/or observer network established. Office preparations include: (1) the drawing of hydrometeorological data flow charts, (2) compiling estimates for maximum probable floods, and (3) writing flood forecasting handbooks. Alertness requires an early warning storm alert system which incorporates quantitative precipitation forecasts and storm tracking. Useful input to this sytem includes satellite photographs, forestry lookout towers, and ham radio operator reports. (See also W77-01933) (Humphreys-ISWS)
W77-01939

FLOOD MEASUREMENTS IN AN URBAN ENVIRONMENT: A DATA USER'S VIEWPOINT,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W77-01940

THE OPERATIONAL USE OF DIGITAL RADAR DATA FOR FLASH FLOOD MONITORING,
National Weather Service, Silver Spring, Md. Office of Hydrology.
D. R. Greene, and R. A. Clark.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 100-105, 1974. 3 fig, 6 ref.

Descriptors: *Flash floods, *Monitoring, *Precipitation(Atmospheric), *Remote sensing, Radar, Surveys, Rainfall disposition, Rainfall intensity, Measurement, Data processing, Computers, Digital computers, Rates, Distribution patterns, Precipitation intensity.

Observation of rainfall on a fine temporal and spatial scale and prediction in the short period (0-2 h) are prime ingredients of a flash flood monitoring system. The system should include information on the intensity, speed and direction of movement, configuration, and orientation of the storm. The instantaneous remote sensing capability of radar allows it to detect accurately, with good resolution, storm rainfall patterns and the spatial discontinuities and temporal fluctuations associated with these patterns. Radar coupled with a dedicated digital computer provides the means in real time to observe automatically and accumulate rainfall amounts. Through extrapolation, future rainfall totals may be estimated, thereby giving alert to potential flood producing conditions. One severe flash flood-producing storm was analyzed objectively through the use of the computer software package under development for flash flood monitoring. The results of the study showed that the real time, automated, operational use of digital radar data holds real promise for the detection, identification, and prognosis of potentially severe flash flood-producing storms. (See also W77-01933) (Humphreys-ISWS)
W77-01941

SYSTEMS FOR PREPARING TIMELY FLASH FLOOD WARNINGS,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 4A.
W77-01942

THE USE OF REMOTE SENSING SYSTEMS IN MONITORING DESERT FLOODS,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
A. Porath, and A. P. Schick.
In: Flash Floods; Proceedings of the Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No. 112, p 133-139, 1974. 3 fig, 15 ref.

Descriptors: *Flash floods, *Warning systems, *Monitoring, *Deserts, *Arid lands, Floods, Instrumentation, Small watersheds, Watersheds(Basins), Flood waves, Flood protection, *Remote sensing.
Identifiers: *Israel.

The remote sensing system of the Nahal Yael Research Watershed in Southern Israel was described. The synchronized recording system which converges to a location several kilometers distant is utilized to provide an alarm system which consists of an automatic dialing apparatus coupled to the countrywide telephone system The center, when dialed, also responds in such a way that the caller can evaluate the flood potential of the catchment at that moment. The general and technical aspects of another flood warning system, based on signals fed by the flood wave itself, were discussed and evaluated in the light of desert conditions. A practical development of that system -- a road traffic light warning system -- was described. (See also W77-01933) (Humphreys-ISWS)
W77-01944

A DRAWDOWN PREDICTION MODEL BASED ON REGRESSION ANALYSIS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W77-02015

ISOTOPIC HYDROLOGY IN THE AMAZONIA 2. RELATIVE DISCHARGES OF THE NEGRO AND SOLIMOES RIVERS THROUGH O-18 CONCENTRATIONS,
Centro de Energia Nuclear na Agricultura, Sao Paulo (Brazil); and Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W77-02016

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS AND LANDSAT DATA-COLLECTION SYSTEM OPERATIONS IN CENTRAL ARIZONA,
Geological Survey, Tucson, Ariz.
For primary bibliographic entry see Field 2C.
W77-02017

AN EVALUATION OF METHODS FOR MEASURING ALGAL GROWTH,
Geological Survey, Doraville, Ga.
For primary bibliographic entry see Field 5A.
W77-02018

INDEXES ASSOCIATED WITH INFORMATION THEORY IN WATER QUALITY,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W77-02025

EVALUATION OF THREE COLLECTING METHODS FOR A RECONNAISSANCE OF STREAM BENTHIC INVERTEBRATES,
Geological Survey, Menlo Park, Calif., and Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 5A.
W77-02028

THERMAL MODELING AND ITS RELATION TO CANAL EVAPORATION,
Geological Survey, Bay St. Louis, Miss.
For primary bibliographic entry see Field 2D.
W77-02029

APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF LAKE EUTROPHICATION IN THE GREAT LAKES BASIN,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5C.
W77-02041

APPLICATION OF LANDSAT TO THE SURVEILLANCE AND CONTROL OF LAKE EUTROPHICATION IN THE GREAT LAKES BASIN,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5C.
W77-02042

7C. Evaluation, Processing and Publication

USE OF PUNCH CARDS FOR ACCUMULATING AND ANALYZING DATA ON THE SANITARY-EPIDEMIOLOGICAL STATE OF RURAL POPULATED AREAS, (IN RUSSIAN),
For primary bibliographic entry see Field 5G.
W77-01600

BOUNDARY-LAYER TRAJECTORY ESTIMATES COMPARED WITH CONSTANT-VOLUME BALLOON TRAJECTORIES IN THE GREAT PLAINS,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Lab.
For primary bibliographic entry see Field 2B.
W77-01701

AN EVALUATION OF PRECIPITATION PH DATA FROM THE WASHINGTON, DC AREA COLLECTED DURING 1975,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Lab.
For primary bibliographic entry see Field 2B.
W77-01703

MONITORING GROUNDWATER QUALITY: DATA MANAGEMENT,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W77-01773

PROCEDURES MANUAL FOR MONITORING SOLID WASTE DISPOSAL SITES,
Wehran Engineering Corp., Middletown, N. Y.
For primary bibliographic entry see Field 5B.
W77-01774

NATIONAL EUTROPHICATION SURVEY: DATA ACQUISITION AND LABORATORY ANALYSIS SYSTEM FOR LAKE SAMPLES,
Environmental Monitoring and Support Lab., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W77-01788

ANALYSIS OF MARINE MAMMAL REMOTE SENSING DATA,
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 6G.
W77-01825

DESIGN OF SURFACE WATER DATA NETWORKS FOR REGIONAL INFORMATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W77-01885

AN EXAMINATION OF THE RELIABILITY OF SHORT TERM RECORDS IN PRECIPITATION VARIABILITY STUDIES,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 2B.
W77-01904

LAKE SUPERIOR BATHYTHERMOGRAPH DATA,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W77-01912

POTENTIAL USE OF SATELLITE IR DATA FOR ICE THICKNESS MAPPING,
Development and Resources Transportation Co., Silver Spring, Md.
For primary bibliographic entry see Field 2C.
W77-01913

COLLECTION AND PROCESSING SYSTEM OF HYDROLOGICAL DATA DURING FLASH FLOODS ON THE RIVER YODO,
Kyoto Univ. (Japan).
For primary bibliographic entry see Field 2E.
W77-01934

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70: PART 7. LOWER MISSISSIPPI RIVER BASIN--VOLUME 1. LOWER MISSISSIPPI RIVER BASIN EXCEPT ARKANSAS RIVER BASIN.
Geological Survey, Reston, Va.
Available from Supt.of Documents, GPO, Wash., D.C. 20402, price $9.60. Water-Supply Paper 2120, 1975. 1278 p, 1 fig.

Descriptors: *Hydrologic data, *Surface waters, *Streamflow, *Lakes, *Mississippi River basin, Arkansas, Kentucky, Louisiana, Mississippi, Missouri, Oklahoma, Tennessee, Texas, Basic data collections, Runoff, Discharge(Water), Gaging stations, Flow measurement, Flow rates, Average flow, Reservoirs, Reservoir stages.
Identifiers: *Lower Mississippi River basin, Maximum discharges, Minimum discharges, Reservoir content.

This is one of 37 reports presenting records of stage and discharge of streams, and of stage and contents of lakes and reservoirs in the United States during the 1966-70 water years; it contains the records for gaging stations and partial-record stations in the Lower Mississippi River basin except Arkansas River basin. The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries of total, average, maximum, and minimum discharges. Data for partial-record stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations, and the second is a table of annual maximum stage and discharge at crest-stage stations. For most gaging stations on lakes and reservoirs the data comprise a description of the station and a monthly summary table of stage and contents. For some reservoirs a table showing daily contents or stage is given. (Woodard-USGS)
W77-02009

GROUND-WATER RECORDS FOR SOUTHEASTERN OKLAHOMA: PART 1--RECORDS FOR WELLS, TEST-HOLES, AND SPRINGS,
Geological Survey, Oklahoma City, Okla.
J. S. Havens, and D. L. Bergman.
Open-file report, June 1976. 59 p, 26 ref.

Descriptors: *Well data, *Water levels, *Test wells, *Springs, *Oklahoma, Aquifers, Water yield, Water users, Locating, Sites, Maps, *Groundwater, *Data collections, Publications.
Identifiers: Southeastern Oklahoma.

Both published and unpublished records are presented for approximately 1,780 wells, test-holes, and springs for 16 counties in southeastern Oklahoma. In addition, selected references to pertinent ground-water reports covering parts of the 16-county area are included. (Woodard-USGS)
W77-02024

LIMNOLOGICAL SURVEY OF SACONY CREEK BASIN, BERKS COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 5A.
W77-02026

HYDROLOGIC UNIT MAP--1974, STATE OF NORTH DAKOTA.
Geological Survey, Reston, Va.
Available from USGS, Reston, VA 22092, price $1.25. Hydrologic Unit Map of North Dakota, 1976. 1 sheet.

Descriptors: *Maps, *Hydrology, *North Dakota, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Hydrologic unit maps(N Dak), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in North Dakota that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W77-02031

WATER RESOURCES OF THE RAINY LAKE WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
D. W. Ericson, G. F. Lindholm, and J. O. Helgesen.
Available from U. S. Geological Survey, Reston, Va. 22092, price $1.00. Hydrologic Investigations Atlas HA-556, 1976. 2 sheets, 3 figs, 17 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Minnesota, Water utilization, Hydrologic budget, Lakes, Streamflow, Aquifers, Glacial drift, Bedrock, Water yield, Water supply, *Maps.
Identifiers: *Rainy Lake watershed(Minn).

The Rainy Lake watershed is one of 39 watershed units designated by the Minnesota Department of Natural Resources for evaluation of the State's water resources. Included is an appraisal of the occurrence, quantity, quality, and availability of ground and surface waters. Fifteen percent of the watershed is lakes, 10 acres or larger, that are interconnected by a complex stream network. The abundance of surface water and the wilderness environment make the watershed unique as a recreational area. Lakes in the watershed are major controls on streamflow. They store and slowly release overland runoff, thereby sustaining flow. Surface water supplies used in thewatershed in 1971 totaled 851 million gal, more than half of which was for municipal supplies. A much larger amount was withdrawn and returned directly to streams or lakes after industrial use. Most surface waters have a dissolved-solids concentration of less than 100 mg/liter and are considered soft. Glacial drift is the most favorable source of ground water. In most areas, however, drift is less than 50 ft thick and discontinuous, thereby limiting its reliability as a source of water. Crystalline bedrock, the only alternate source of ground water, is relatively unproductive. Most ground water is of the calcium bicarbonate type, commonly hard, and, in places, contains excessive amounts of iron and manganese. (Woodard-USGS)
W77-02032

WATER RESOURCES OF THE LITTLE FORK RIVER WATERSHED, NORTHEASTERN MINNESOTA,
Geological Survey, St. Paul, Minn.
J. O. Helgesen, G. F. Lindholm, and D. W. Ericson.
Available from USGS, Reston, Va 22092, price $1.75. Hydrologic Investigations Atlas HA-551, 1976. 2 sheets, 17 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Hydrologic budget, Water utilization, Aquifers, Glacial drift, Bedrock, Groundwater movement, Streamflow, Flow rates, Floods, Lakes, Maps.
Identifiers: *Little Fork River(Minn).

The Little Fork River watershed is one of 39 watershed units designated by the Minnesota Department of Natural Resources for evaluation of the State's water resources. Included is an appraisal of the occurrence, quantity, quality, and availability of ground and surface waters. Water resources are not intensively developed anywhere in the watershed. Essentially all water used is withdrawn from ground-water sources, mainly glacial drift, which ranges from 0 to over 200 feet (61 meters) in thickness. Buried sand and gravel in the drift is the most favorable source for development. Most ground water is of the calcium or calcium magnesium bicarbonate type. The degree of mineralization generally increases downgradient in the flow system. Ground water is commonly very hard and high in iron and manganese. Lakes and wetlands have a natural regulating effect on streamflow. Water in streams is of the calcium bicarbonate type. The amount of mineralization reflects surficial geology, being greatest in streams draining glacial-lake sediments and least in streams draining areas of sand lakes. Color and iron concentration in stream waters generally exceed recommended domestic consumption limits. (Woodard-USGS)
W77-02033

STORMWATER STUDIES AND ALTERNATIVES IN ATLANTA,
Jordan, Jones, and Goulding, Inc., Atlanta, Ga.
For primary bibliographic entry see Field 5B.
W77-02073

WASTEWATER STORAGE-SIMULATION OF INSTREAM EFFECTS,
Kentucky Dept. for Natural Resources and Environmental Protection, Frankfort.
For primary bibliographic entry see Field 5B.
W77-02074

8. ENGINEERING WORKS

8B. Hydraulics

SHUNT LINE METERING SYSTEM FOR IRRIGATION WELLS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
For primary bibliographic entry see Field 8G.
W77-01623

NEW DEVELOPMENTS WILL CUT DRILLING TIME, EXPENSE,
Gulf Publishing Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W77-01764

MANUAL OF WATER WELL CONSTRUCTION PRACTICES.
National Water Well Association, Worthington, Ohio.
EPA Office of Water Supply, 570/9-75-001, 1975, 156 p, 6 fig, 12 tab, 7 append, 3 plates.

Descriptors: *Water wells, *Construction, *Construction materials, *Standards, *Design, Drilling, Formations(Geologic), Aquifers, Screens, Drilling fluids, Drilling equipment, Well screens, Grouting, Filtering systems, Sands, Gravels, Water sampling, Testing procedures, Test wells, Bioassay, Publications.
Identifiers: *Water well construction standards, Drilling methods, Formation sampling methods, Test holes, Casing selection, Well disinfection, Well abandonment.

The primary purposes of well construction standards are to protect the health, safety and welfare of the public; to protect ground-water resources, and the environment in general for present and future use; and to permit optimum water production from each well at minimal cost. These standars have been prepared to accomplish these purposes and to obtain the most appropriately designed well. When properly used, they will result in adequate minimum specifications for water well construction. Throughout the manual, the general plan followed is that the higher the coded number used with a specific Article the higher is the quality or design of the material or construction method used. However, special conditions may require specific and unique solutions. Equal weight is given a number of choices occasionally, since no one method may be any more efficient or effective than another for some geohydrologic conditions. These standards are designed to improve communications between the planner and the technical man in the field. They will assist planners in preparing satisfactory specifications for the majority of wells, to be drilled. (Heiss-NWWA)
W77-01777

VERIFICATION OF HYDROELASTIC SIMILITUDE CRITERIA,
Research Inst. for Water Resources Development, Budapest (Hungary). Dept. for Hydromechanics.
O. Haszpra.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. HY4, p 469-481, Proceedings paper No. 12048, April 1976. 7 fig, 16 ref.

Descriptors: *Hydraulic models, *Hydraulics, *Vibrations, Model studies, Structures, Equations.
Identifiers: *Similitude, *Similarities, *Hydroelasticity, Scale effect, Froude law.

When modeling flow-induced vibrations of hydraulic structures, in most cases the similitude of the inertial, elastic, and gravitational forces must be ensured according to the Froude law, but sometimes the gravitational force can be neglected. This paper treats the most important scale ratios. The systematic experimental verification gives instructions on the applicable geometric scale and the reliability of the prototype data determined from the model. The error of the frequencies is shown to be within + or - 10%, while that of the amplitudes hardly attains -50%. The internal damping of the model material influences the results, but in comparison with the effect of the water damping it could be neglected. (Bell-Cornell)
W77-01880

A STOCHASTIC SEDIMENT YIELD MODEL FOR BAYESIAN DECISION ANALYSIS APPLIED TO MULTIPURPOSE RESERVOIR DESIGN,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 4D.
W77-01892

A STUDY OF MOLECULAR PARAMETERS INFLUENCING POLYMER DRAG REDUCTION,
Naval Underseas Center, San Diego, Calif.
R. H. Wade.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A020 813, Price codes: A03 in paper copy, A01 in microfiche. Report NUC TP 473, July 1975. 37 p, 26 fig, 14 ref, 3 append.

Descriptors: *Molecular structure, *Polymers, *Drag, Chemical properties, Mechanical properties, Water properties, Hydrogen ion concentration, *Ionization, Flow, Polyelectrolytes, Chemistry, Hydraulics.
Identifiers: *Drag reduction, Molecular parameters, *Chain branching, *Cross-linking, Flow noise.

Three parameters, chain branching, ionization, and cross-linking, were studied for their effect on drag reduction in turbulent flow. Drag reduction was shown to increase as polymers are altered with long branches but to decrease as larger numbers of shorter branches are attached. Linear polymers too low in molecular weight for inherent drag-reduction capability became effective drag reducers through the grafting of long branches. Larger polymers had their drag reduction destroyed by the addition of many short branches or enhanced by the addition of fewer, but longer, branches. The drag-reduction function of polyelectrolytes was reversibly destroyed or enhanced by changes in configuration resulting from changes in pH or ionic strength or by complexing with counter-ion polyelectrolytes. The effects of counter-polyion complexing were related to reversible cross-linking and branching as stoichio-metric ratios were varied. Cross-linking was shown to be an effective method to produce large drag-reducing molecules. Drag reduction was completely destroyed by excessive cross-linking. Under actual conditions of drag reduction in turbulent flow, polymer degradation was somewhat less in branched and cross-linked molecules than in linear ones. (Sims-ISWS)
W77-01915

8C. Hydraulic Machinery

NONAXIAL UPLIFT TESTS ON STRAIGHT AND BELLED AUGER MODEL FOOTINGS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8G.
W77-01683

A MATHEMATICAL MODEL FOR PREDICTING RIVER TEMPERATURES-APPLICATION TO THE GREEN RIVER BELOW FLAMING GORGE DAM,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 4A.
W77-01684

SELECTING HYDRAULIC REACTION TURBINES,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
R. N. Walters, and C. G. Bates.
Office of Design and Construction, Water Resources Technical Publication, Engineering Monograph No. 20, 1976. 49 p, 40 fig.

Descriptors: *Hydroelectric powerplants, *Hydraulic machinery, *Hydraulic turbines, *Turbine runners, *Turbines, *Draft tubes, Cavitation, Francis turbines, Power head, Governors, Performance.
Identifiers: *Spiral cases, *Turbine efficiency, Cavitation index.

This revised monograph reflects modern trends in the selection of hydraulic reaction turbines. Figures are included which show characteristics of the turbine in relation to various parameters for estimating size and predicting performance of the unit. (Bureau of Reclamation)
W77-01685

AN INVESTIGATION OF TECHNIQUES TO EXPEDITE SYNCHRONIZING FOR PUMP-STORAGE UNITS AND STANDBY GENERATING UNITS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
F. R. Schleif.
April 1975. 37 p, 11 fig, 3 tab, 10 ref, append; Experimental Verification, Phase 2, Nov.1975, May 1976, 46 p. Bur Recam 5-01-ER-01779.

Descriptors: *Electric generators, *Pumped storage, California, *Generators, Electrical equipment, Hydroelectric power.
Identifiers: *Synchronizers, *San Luis pump-storage plant(Calif).

The rapid startup potential of hydro and pumped-storage power is placed at a premium by the increasing preponderance of thermal power sources which inherently have rather sluggish response. To better exploit the rapid startup potential, the latitudes and constraints of synchronizing are examined and means are developed to expedite the synchronizing process. A special synchronizer is developed with compensation for acceleration and with sensitivity to residual voltage. By this means, transients of induction synchronizing are reduced, pull-in torque may be increased, and full voltage synchronizing may be achieved at higher acceleration and in less time for start up of emergency standby units. (Bureau of Reclamation)
W77-01686

SELF-REGULATING TIDE GATE,
Rockwell (W. S.) Co., Fairfield, Conn. (Assignee).
M. Mirto, Jr.
U.S. Patent No. 3,974,654, 4 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 907, August 17, 1976.

Descriptors: *Patents, *Gates, *Engineering structures, Flood gates, Barriers, Flow control, Gate control, Tidal marshes, Tidal waters.
Identifiers: Tide gates.

A relatively simple and inexpensive tidal flow device which would permit full tidal flow through a dike but which would stop this flow automatically at a predetermined water level to avoid tidal flooding is described. The device for controlling the flow of water from a conduit open end into a wetland or reservoir is comprised of a flow control

gate which is pivotally mounted at its lower edge upon a horizontal axis in the vicinity of the bottom of the conduit opening. The gate is pviotable upward against the coduit opening to a closed position. A bracket extends from above the conduit and has a slot which is substantially parallel to the longitudinal axis of the conduit. A rod is pivotally connected to the top of the gate and extends upward through the bracket slot. A float is positioned on the rod above the bracket so that, as the level of the water in the tidal body rises, the float will rise to pivot the gate upward toward the closed position. This gate can be closed manually in the event of an advanced storm warning when reserved water volumes are necessary in order to reduce storm sewer flooding in the areas adjacent the marsh. (Sinha-OEIS)
W77-01728

WATER GATE,
R. L. Halpern, and C. L. Skiles.
U.S. Patent No. 3,974,655, 5 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 949, No 3, p 907, August 17, 1976.

Descriptors: *Patents, *Gates, *Engineering structures, *Barriers, *Flow control, Water pollution control, Gate control, Balloons, Pumps, Florida.
Identifiers: Water gates, Water balloons.

To permit a pollution-free connection of a polluted with an unpolluted body of water or an estuary or stream, a pair of gates is provided which will confine the pollutants to the polluted body of water and prevent their dissemination to or intrusion into connected bodies of water which would otherwise be pollution-free. The devices are acceptable to pollution control authorities in the State of Florida where the problem is of wide extent. As two types of gate are shown in this application the first will be referred to as the 'balloon type' and the second as the 'shutter type'. A waterway has side recesses on either side and a bottom recess for lodgment of the balloon when the gate is open. The water balloon is in collapsed position when the waterway is open. To close the gate a pump pumps water into the balloon to expand its dimensions to form a closure. To reopen the gate the action of the pump is reversed. The shutter type gate uses an air compressor and tank to inflate the balloon which raises a shutter to close the waterway. (Sinha-OEIS)
W77-01729

DRIP IRRIGATION VALVE WITH SPRING BIASED PLUNGER,
For primary bibliographic entry see Field 3F.
W77-01731

SYSTEM FOR UTILIZING ENERGY IN A FLUID CURRENT,
D. Z. Bailey.
U.S. Patent No. 3,978,345, 7 p, 8 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 949, No 5, p 2135, August 31, 1976.

Descriptors: *Patents, *Energy, *Currents(Water), *Flow, Movement, Running waters, Energy conversion, Equipment, Hydraulic structures.
Identifiers: Power generation.

The system comprises a firmly anchored strong cable suspension which spans a flowing stream of water. At spaced intervals on the cable suspension, flotation barges are attached to assure a rather stable and uniformly supported stretch of the suspension cable system across the stream. A corresponding number of rotors are suspended from the flotation barges with their rotational axes transverse to the stream current and the rotors turning in generally vertical planes. Intervened with the flotation barges and rotors and pivotally mounted on individual suspension cables are lifting foils and associated controls for cyclically regulating the angles of attack of the foils relative to the current and for assuring a relatively constant resultant lift force from each foil during its complete rotational cycle. The resultant forces produced through the foil elements generate unidirectional rotation of the rotors with the suspension cables, and the rotor movement in turn activates useful power generating means. (Sinha-OEIS)
W77-01752

DOUBLE-FLOW MAGNETIC FILTER, APPARATUS AND METHOD,
Kraftwerk Union A.G., Muelheim an der Ruhr (West Germany). (Assignee).
For primary bibliographic entry see Field 5F.
W77-01758

EVALUATION OF EFFECTIVENESS OF RESERVOIR DESTRATIFICATION,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W77-01821

8D. Soil Mechanics

METHOD OF PROTECTING A PILE IMBEDDED IN OFFSHORE AREAS HAVING A SHIFTING LAYER OF MUD,
Union Oil Co. of California, Brea. (Assignee).
G. P. Maly, and C. A. Tannahill.
U.S. Patent No. 3,972,198, 7 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 54, August 3, 1976.

Descriptors: *Patents, *Engineering structures, *Soil mechanics, *Piles(Foundations), Coastal structures, Movement, Flow, Mud, Mudflows, Engineering geology.
Identifiers: Offshore technology, Sediment properties, Geotechniques.

A method is described for protecting a stationary rigid pile extending through a layer of mud suceptible to movement and imbedded in an underlying competent bottom from the forces that a moving layer of mud can exert against the pile, and for reducing the forces that a moving layer of mud is exerting against the pile. Fluid is ejected from the interior of the pile above the competent bottom into the mud adjacent to the pile. The fluid will be ejected at a volumetric rate sufficient to adequately increase the fluid content of the mud, i.e., fluidize the mud, thereby increasing the lubricity of the mud and reducing the abrasiveness, cohesiveness and shear stress of the mud adjacent to the pile, with a resulting reduction in the forces that the moving layer of mud can exert against the pile. (Sinha-OEIS)
W77-01711

PORE PRESSURES NEAR MOVING UNDERWATER SLOPE,
Waterloopkundig Laboratorium, Delft (Netherlands).
K. L. Meijer, and A. G. van Os.
Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. GT4, p 361-372, Proceedings paper No. 12021, April 1976. 5 fig, 1 tab, 15 ref.

Descriptors: *Underwater, *Slopes, *Pore water, *Pressure, *Consolidation, Soil mechanics, Dredging, *Pore pressure.
Identifiers: *Dilatancy, Finite differences.

Pore pressures near a moving boundary of a saturated soil mass are calculated and compared with tests. For a more realistic approximation of the stress-strain behavior of soil, a dilatancy effect has been introduced that is based upon Rowe's stress-dilatancy relation and the assumption of a linear relationship between the principal stress ratio and the major principal strain. The field equations for the problem have been transformed to account for the traveling boundary. A pseudo three-dimensional consolidation theory is used to describe the fluid-soil skeleton interaction. The results of the computations have been compared with pore-pressure measurements and show reasonable agreement if dilatancy is accounted for. (Bell-Cornell)
W77-01879

8F. Concrete

NEW DEVELOPMENTS WILL CUT DRILLING TIME, EXPENSE,
Gulf Publishing Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W77-01764

OPTIMIZING SELECTION OF MARINE RETAINING WALLS,
Mueser, Rutledge, Wentwork and Johnston, New York.
R. C. Johnston, M. Bernheimer, and D. A. Zarrella.
Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. GT12, Proceedings paper No. 12624, p 1209-1224, December 1976. 7 fig, 2 tab.

Descriptors: *Bulkheads, *Land use, *Retaining walls, *New York, Harbors, Costs, Concrete construction, Sheet piling, Shore protection, Optimum development plans, Economics, Estimating, Projects.

The factors involved in selecting an appropriate perimeter bulkhead or retaining structure for waterfront developments are examined with particular emphasis on conditions in New York Harbor. The selection process is illustrated by descriptions of two recent cases. For Battery Park City, considerations of moderate first cost, low maintenance, and long life lead to the choice of a low-level relieving platform above a stone embankment for the perimeter structure. At Northeast Marine Terminal, retaining structures included a sheet pile wall, circular cells, and a relieving platform, each adapted to existing conditions to minimize first cost and yet provide necessary stability and a medium length usable life. (Bell-Cornell)
W77-02072

8G. Materials

SHUNT LINE METERING SYSTEM FOR IRRIGATION WELLS,
Colorado State Univ., Fort Collins, Dept. of Civil Engineering.
W. C. Hill, and J. F. Ruff.
Transactions of the American Society of Agricultural Engineers, Vol. 19, No. 3, p 494-500, May-June 1976. 15 fig, 2 tab, 5 ref.

Descriptors: *Flow measurement, *Wells, *Irrigation wells, *Orifices, Calibrations, Laboratory tests, Equations, Mathematical studies, Instrumentation, Measurement, Pipes.
Identifiers: *Shunt line meter.

The testing and development of a shunt line metering system with segmental orifice were described. This type of metering system provides a low cost means of cumulatively measuring the volume of water discharged from irrigation wells. The flow through the shunt line, which was measured by a small household type water meter, was related to the flow through the main irrigation pipe by a flow coefficient which was experimentally determined for a 15.41 cm (6 in) pipe. This flow coefficient is a

function of the degree of orifice contraction. It was pointed out that the field calibration of the meter was not necessary. The cost of the metering system can be less than $100, and the accuracy was shown to be within + or - 5%. (Bhowmik-Isws)
W77-01623

SNOW-ROAD CONSTRUCTION--A SUMMARY OF TECHNOLOGY FROM PAST TO PRESENT,
Civil Engineering Lab. (Navy), Port Hueneme, Calif.
For primary bibliographic entry see Field 4C.
W77-01638

EVALUATION OF THE USE OF SALT BRINE FOR DEICING PURPOSES,
Connecticut Dept. of Transportation, Rocky Hill, Materials Testing Lab.
For primary bibliographic entry see Field 4C.
W77-01639

NONAXIAL UPLIFT TESTS ON STRAIGHT AND BELLED AUGER MODEL FOOTINGS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
J. Merriman.
Report REC-ERC-76-9, June 1976. 21 p, 15 fig, 3 tab, 2 ref.

Descriptors: Uplift pressure, Laboratory tests, *Transmission towers, Soil mechanics, Strain gages, Strain measurement, Design, Model studies, Testing procedures.
Identifiers: *Belled footings, *Auger-type footings, Pull-out tests, Anchored towers.

A second series of model tests has been conducted to expand on data previously obtained on pullout forces on belled and straight auger footings used for transmission line towers. This test was performed to determine the effect of different angles of pullout on the load resistance of these two footing types which were cast-in-place in a compacted silty clay. The tests were performed on instrumented, reinforced concrete model footings. The results show that the greatest load resistance is obtained with a belled footing and also is greater when the pullout force is at an angle. (Bureau of Reclamation).
W77-01683

USE OF OUTER BARS OF INLETS AS SOURCES OF BEACH NOURISHMENT MATERIAL,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
For primary bibliographic entry see Field 2L.
W77-01708

LOW ADHESIONAL ARCTIC OFFSHORE PLATFORM,
Chevron Research Co., San Francisco, Calif. (Assignee).
T. A. Hudson, and G. E. Strickland, Jr.
U. S. Patent No. 3,972,199, 14 p, 8 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 949, No 1, p 55, August 3, 1976.

Descriptors: *Patents, *Engineering structures, *Offshore platforms, *Ice, *Ice-water interfaces, *Ice loads, Pressure, Coatings, Protective coatings, Films, Adhesion.
Identifiers: Offshore technology.

A method is provided for preventing the natural ice from freezing on or strongly adhering to the surfaces of the offshore structure exposed to the water in the zone of natural ice formation. Heat is applied to the inner or outer surface of the outer wall or shell of the structure, particularly adjacent the water line, where the natural ice will tend to freeze onto or impinge against the shell. The temperature of the outer surface of the shell will be maintained above the melting point of the ice. The heat can be applied continuously to prevent adhesion of ice to the shell and to provide a film of water between the ice and the outer surface of the shell to assist the ice in slipping over and upon this surface to reduce the force imposed on the structure by moving ice sheets. The exterior of the shell is coated with a material that reduces ice adhesion such as halocarbon resins. The coating supplants or assists the film of water while at the same time reducing the adhesional bond between the ice and the material. The material can function as a backup on an emergency situation where the heating system fails. The material also reduces the amount of heat needed since the adhesional bond is significantly reduced as a result of the coatings. (Sinha-OEIS)
W77-01712

WATER CONDITIONING DEVICE,
Marian Co., Chicago, Ill. (Assignee).
For primary bibliographic entry see Field 5F.
W77-01727

NEW DEVELOPMENTS WILL CUT DRILLING TIME, EXPENSE,
Gulf Publishing Co., Houston, Tex.
T. R. Wright, Jr.
World Oil, Vol. 183, No. 5, p 79-83, October, 1976. 9 fig.

Descriptors: *Drilling equipment, *Wells, Drilling, *Oil wells, Cements.
Identifiers: *Continuous drill string, *Vibrating pile driver, *Flex-joints, *Cementing system.

Drilling in the United States and abroad is continuing at a high rate. As a result of the efforts of operators, drilling contractors and equipment suppliers, some new ideas have been developed including the following. A new portable land rig equipped with a 2 3/8-inch continuous string of pipe, designed and manufactured by Uni-Flex Rig Company, Ltd. of Brooks, Alberta, to quickly dig shallow (3,000 foot maximum) wells. The highly mobile rig requires only a single load when earthen pits are sued and weighs only about 75,000 pounds, excluding the truck. The rig can be operated with a two-man crew and make trips at about 100 fpm. An efficient, quieter system for driving oil well conductor pipe was recently used. Thums Long Beach Company used the vibratory pile driver, which was estimated to reduce decible range by about one-half when using alternative methods. A new oil well cementing system has been developed which allows virtually any cement job to be blended, mixed and pumped on the rig using neat cement and liquid additives. Main advantages are a reduction in time lost waiting on delivery of cement from onshore facilities and a reduction in the amount of cement wasted. Lord Kinematics Marine Products Group of Erie, Pennsylvania, has developed a new flex-joint. By using laminated rubber and metal seals in the joint, the need for complex hydraulic systems previously required for balancing internal and external pressures is eliminated. Laminated reduces bending stresses, allows motion, reacts to high tensile loads, and eliminates sliding wearing surfaces. (Grober-NWWA)
W77-01764

MAKING DOWNHOLE MEASUREMENTS THROUGH MODIFIED DRILL PIPE,
Shell Development Co., Houston, Tex.
E. B. Denison.
World Oil, Vol. 183, No. 5, p 86-89, 94, October, 1976. 8 fig, 3 ref.

Descriptors: *Monitoring, Sampling, *Electrical well logging, Water wells, *Measurement, Drilling, Data collections, Drill holes, Drillers logs, Drill samples, Drill monitors.
Identifiers: *Downhole parameters, *Electrical data collecting, Borehole surveying, Electrical data transmission, *Drill pipes.

The ability to continuously monitor downhole parameters while drilling has great utility for safety, logging, borehole surveying and drilling optimization. Shell Development Company, Houston, has designed a new type of drill pipe that is used as an electrical circuit to transmit from the downhole measuring device to the surface. The system uses electrical data transmission, which makes it possible to simultaneously monitor dozens of downhole parameters. A frequently cited disadvantage of integral-circuit drill pipe is shorting potential due to multiple connections; however, field test results are very encouraging. The drill pipe circuit reliability equaled expectations. The problems that developed were minor. Field testing of the complete system should be accomplished during 1976, along with additional long-term integrity testing of a limited number of joints of the special drill pipe. (Grober-NWWA)
W77-01766

THE CABLE TOOL BIT,
National Water Well Association, Worthington, Ohio.
R. B. McDannald.
Water Well Journal, Vol. 30, No. 10, p 18-19, October, 1976.

Descriptors: *Drilling equipment, Limestones, Fissures, Sandstones, Granites, Shales, Water wells, Drilling.
Identifiers: *Cable tool drilling, *Drill bit, California type bits, Mother hubbard bit, Twisted blade bit, Spudding bit, Offset bit, Star bit.

The drill bit, one of the more important tools in the drill string, does the actual drilling. It consists of a cutting edge, body in which water channels are formed, and a pin joint on its upper end. The bottom of the bit is flared out from the body section and conforms to the gauge diameter of the hole to be drilled. The length of the bit determines its weight. Eight important factors should be considered in designing and shaping the bottom of a bit; angle of penetration, angle of clearance, wearing surface, reaming edge, area of crushing face, area of water course, contour of penetrating edge, and cross section of drill bit. Each factor has its usefulness, whether it be penetrating, crushing, reaming or mixing, depending on the type of rock formation to be drilled through. It is always desirable to include pairs of bits in the tool equipment. Including four or six bits of each diameter, and at least 2 of each type, will prove economical by keeping the drilling machine in steady production. (Grober-NWWA)
W77-01767

HOW TO DRILL A USABLE HOLE, PART 3, SELECTING THE DRILL COLLAR STRING,
Drilco, Houston, Tex.
G. E. Wilson, and W. R. Garrett.
World Oil, Vol. 183, No. 5, p 99-102, October, 1976. 5 fig.

Descriptors: *Drilling equipment, *Drilling, Boreholes, Wells, Construction costs, *Design.
Identifiers: *Drill collars, Drill collar design, Thread connection, Special designs.

The proper selection of a drill collar string is important to obtain a trouble free, usable borehole at minimum cost. The drill collar provides bit weight in the amount needed, assists in obtaining and maintaining desired hole direction, and insures prolonged drill pipe life and performance. Drill collars are available in many combinations of sizes and thread types. Selection of the size and type of collar should be based on the size of hole to be drilled and the subsurface conditions expected to be encountered. When selecting connections it should be noted that the design of the best rotary

shouldered connection for a drill collar calls for the pin and box to be balanced in bending fatigue. Other consideration in the drill collar selection process are special features. Popular special features include fishing necks, stepped bores, slip and elevator recesses and spirial grooving. (See also W76-11915) (Heiss-NWWA)
W77-01768

MANUAL OF WATER WELL CONSTRUCTION PRACTICES.
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 8B.
W77-01777

8I. Fisheries Engineering

A MATHEMATICAL MODEL FOR PREDICTING RIVER TEMPERATURES-APPLICATION TO THE GREEN RIVER BELOW FLAMING GORGE DAM,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 4A.
W77-01684

MOVEMENTS OF TAGGED JUVENILE MENHADEN (BREVOORTIA PATRONUS) IN THE GULF OF MEXICO,
National Marine Fisheries Services, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
R. L. Kroger, and P. J. Pristas.
Texas Journal of Science, Vol. 26, Nos. 3-4, p. 473-477, 1975. 1 fig., 1 tab., 7 ref.

Descriptors: *Tagging, *Fish migration, *Gulf of Mexico, Commercial fishing, Juvenile fish, Estuaries, Mississippi, Louisiana, Texas, Fish management.
Identifiers: *Menhaden.

Movement of juvenile Gulf menhaden were investigated in order to improve methods of predicting incoming year-class strength and recruitment of 1-year old menhaden to the commercial fisheries. A total of 9,912 juveniles were tagged and released in 11 estuaries from Brownsville, Texas to Pensacola, Florida. Tags which were recovered in menhaden reduction plants, indicated that most 1-year old menhaden return to the fishing area near the estuaries where they were produced. Juvenile menhaden produced in estuaries west of the Mississippi River Delta did not occur in significant numbers as 1-year old fish in waters east of the Delta and vice versa. These results indicate that the recruitment of 1-year old menhaden to each of the three commercial fishing areas is dependent on the number of juveniles produced in estuaries in and adjacent to each fishing area. The hypothesis that menhaden produced in the extreme western and eastern Gulf estuaries contribute as 1-year fish to the catches made in the western and eastern fisheries, respectively was only partially supported because tags were not recovered from several sites. Initial returns of a followup tagging study have yielded similar results. (Luedtke-Wisconsin)
W77-02066

9. MANPOWER, GRANTS AND FACILITIES

9D. Grants, Contracts, and Research Act Allotments

DIRECTORY TO U.S. GEOLOGICAL SURVEY PROGRAM ACTIVITIES IN COASTAL AREAS, 1974-76,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2L.
W77-02011

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

1975 REVIEW OF THE LITERATURE ON PULP AND PAPER EFFLUENT MANAGEMENT,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 05D.
W77-01678

ASSESSMENT OF AVAILABLE LITERATURE ON EFFECTS OF OIL POLLUTION ON BIOTA IN ARCTIC AND SUBARCTIC WATERS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 05C.
W77-01871

DIRECTORY TO U.S. GEOLOGICAL SURVEY PROGRAM ACTIVITIES IN COASTAL AREAS, 1974-76,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 02L.
W77-02011

BIBLIOGRAPHY AND SELECTED ABSTRACTS OF REPORTS ON WATER RESOURCES AND RELATED SUBJECTS FOR ARKANSAS THROUGH 1975,
Geological Survey, Little Rock, Ark.
R. T. Sniegocki.
Arkansas Geological Commission Little Rock, Water Resources Summary No 10, 1976. 237 p.

Descriptors: *Water resources, *Arkansas, *Publications, *Bibliographies, *Abstracts, Groundwater, Surface waters, Hydrogeology, Documentation, Information retrieval, Alluvial aquifers, Analytical techniques, Chemial analysis, Methodology, Planning, Water supply.

Reports prepared on water resources and related subjects for Arkansas through 1975 are listed in this bibliography. Those reports that pertain specifically to water are followed by annotation. A subject index of more than 350 entries will aid in determining the extent of coverage of specific subjects. (Woodard-USGS)
W77-02014

10D. Specialized Information Center Services

HYDROLOGICAL AND HYDRAULICAL CONCEPTUAL MODELS APPLICABLE TO OVERLAND AND RIVER TRANSPORT MODELING,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W77-02036

SUBJECT INDEX

20-YEAR FLOOD
A Report to the New England River Basins Commission on Non-Structural Measures for Flood Plain and Flood Damage Management with Application to the Connecticut River Basin Supplemental Flood Management Study. Phase II. The Formulation and Evaluation of Specific Alternatives,
W77-01696 6F

50-YEAR FLOOD
A Report to the New England River Basins Commission on Non-Structural Measures for Flood Plain and Flood Damage Management with Application to the Connecticut River Basin Supplemental Flood Management Study. Phase II. The Formulation and Evaluation of Specific Alternatives,
W77-01696 6F

ABSCISIC ACID
Abscisic Acid Level in Tomato Leaves After a Long Period of Wilting,
W77-01906 2I

ABSORPTION
Nitrogen and Phosphorus Uptake in the Everglades Conservation Areas, Florida, with Special Reference to the Effects of Backpumping Runoff,
W77-02012 5B

ABSTRACTS
Bibliography and Selected Abstracts of Reports on Water Resources and Related Subjects for Arkansas Through 1975,
W77-02014 10C

ABYSSAL CIRCULATION
Abyssal Circulation of the Southeastern Pacific and some Geological Implications,
W77-01611 2L

ACIDITY OF PRECIPITATION
An Evaluation of Precipitation pH Data from the Washington, DC Area Collected During 1975,
W77-01703 2B

ACOUSTICS
Long-Range Echo Sounding with a Chirp Source,
W77-01614 2L

ACTIVATED CARBON
Method of Producing Char from Pulp Manufacturing Waste Liquor,
W77-01676 5E

Purification of Non-Biodegradable Industrial Wastewaters,
W77-01747 5D

ACTIVATED SLUDGE
Operating Efficiency of Factory Sewage Treatment Plants, (In Russian),
W77-01577 5D

Considerations on the Waste Water Quality and Treatment at the Antibiotics Plant from Jassy, (In Hungarian),
W77-01580 5D

Laboratory Research Methodology of Waste Water Treatability by Activated Sludge Process, (In Hungarian),
W77-01582 5D

The Biodegradability of Some Organic Pollutants Present in the Waste Waters Resulted from the Petroleum Refineries, (In Hungarian),
W77-01583 5D

Some Results of the Full-Scale Tests of the Laboratory Researches on the Biological Treatment of Waste Waters from Hog Breeding Farms, (In Hungarian),
W77-01584 5D

Biological Clarification Plant Started Up at the Wiesloch Corrugated Board Mill (Wellpappe Wiesloch nahm biologische Klaeranlage in Betrieb).
W77-01647 5D

Dewatering of Activated Sludge with Filter Belt Presses,
W77-01651 5D

Apparatus for the Purification of Effluent,
W77-01760 5D

Yeast Plant Wastewater Treatment,
W77-01990 5D

Viscous Product from Activated Sludge by Methanol Fermentation,
W77-01994 5D

ADAPTATION
The Hydrology of Prehistoric Farming Systems in a Central Arizona Ecotone,
W77-01891 3F

ADENOVIRUSES
Hygienic Assessment of Membrane Methods of Water Desalinization, (In Russian),
W77-01554 5D

AERATION
Operating Efficiency of Factory Sewage Treatment Plants, (In Russian),
W77-01577 5D

AFRICA
The Mineralogy and Geochemistry of the Sediments of Northwestern Lake Victoria,
W77-01630 2J

Providing for Provident Dogons,
W77-01896 3B

AGRICULTURAL CHEMICALS
Agricultural Water Pollution: Some Problems Associated with its Control,
W77-01898 5G

AGRICULTURAL RUNOFF
Diffuse Agricultural Pollution: The Economic Analysis of Alternative Controls,
W77-01810 5G

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An Aid to Agricultural Dew Forecasting,
W77-01704 2B

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Applied Climatology and Food Production: The Case of Grapefruit Quality in the Rio Grande Valley of Texas,
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